



FRIDAY, AUGUST 10.

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Contributions.

Combustion Chambers.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I was interested in the remarks in your issue of July 28 concerning "combustion chambers," as I know, from experience, that your views are correct. Some years ago I had charge of the machinery on a road for which five locomotives with combustion chambers were purchased. I had been studying up a theory of coal burning when the importance of combustion chambers was strongly urged, and was pleased with the opportunity to test the theory. The engines were placed in service, men in charge were instructed in their duties and all coal weighed.

The first trouble which developed was that the chamber, which was about 24 in. deep, filled up with ashes and cinders from the front of the fire-box to the tube sheet, closing up the flues. This was caused by an eddy being made by air passing over the fire-box end of the chamber. An ash hoe with a long handle, that fireman could clean the chamber, at once became a part of the engine's outfit. Men were assigned at each end of the run to bore out the flues and everything we could think of was done to prevent this deposit of cinders and plugging up of flues. The engines had diamond stacks and petticoat pipes and these with the grates, ashpans and every-thing were changed, and a fire-brick wall put in, but the deposit remained.

Presently another trouble appeared. The friction, or mechanical action of the cinders over the flanged corner of the fire-box sheet, wore the iron so thin that the sheet cracked. A patch was applied with all the attending trouble of keeping it from leaking in such an exposed position.

Finally a suspicious blister appeared on the inside of the combustion chamber. Examination showed that scale had collected inside the water space, the water being very im- pure, and the sheet was badly "mud burned." Washout plugs had been provided, but the sheet was damaged at a point inaccessible for cleaning.

This was the "last straw." The combustion chamber was cut out and replaced with a straight tube sheet, and the en- gines when replaced in service were found to steam better, with less fuel, than with the combustion chamber. The flues were lengthened the depth of the chamber—24 in. Actual trial showed the fallacy of the idea of burning gas with a com- bustion chamber, described in glowing terms: "Gas rolling into chamber and being consumed." It rolled in, but did not consume worth a cent. It came out of the smoke-box end smoke. The temperature of the gas had been rendered too low to ignite.

As you claim, better results can be obtained by increasing the depth of the fire-box and increasing the heating surface. The deep fire-box admits of good arrangement of fire-brick arch or water table. Fire-brick are preferable, absorbing the heat and giving it off to the gases, keeping them to ignition point. The heat is passed through the metal of the water table to the water, making increased heating surface, but not so effectual a gas burner. The introduction of air is a necessity in burning bituminous coal, but by what means is the proper supply to be regulated? There are scarcely two grades of coal that give the same analysis. Some will take more air than others to produce good combustion. Fresh coal in fire will need more air to mix with the gases than when fuel is fairly ignited; as gas is consumed, less air is required; then the supply must be reduced or the air supplied, instead of being a benefit, becomes a positive injury. As fresh fuel is applied, air in proportion must again be admitted. No prac- tical method of air regulating has as yet been devised. To be effectual it must be automatic.

The objection to tubes on the sides and ends of the fire-box, is that the fire-box sheets will crack out from the tubes. These cracks radiate from centre of tubes and will leak and extend until the removal of the sheets becomes necessary. These fractures are due to the expansion and contraction of the metal, which is of a lower temperature about the tubes. Hollow stay bolts can be used. These are about the best device. The objections are, the opening must

be small, or the strength of the stay reduced beyond the margin of safety. If the diameter is increased, the capacity of the water space is reduced and the danger of burning off the enlarged head is increased. The expense of drilling them is quite heavy; rolled hollow stay bolt iron is not in the market. They have been made by drawing one tube within another but they were a failure.

The most effectual device for introducing air into the fire-box is the baffle plate in the fire door, and I have known very good results obtained by this means. The objection was the handling. They had to be raised and lowered for every shovel-full of coal thrown into the fire-box. The firing being small quantities of coal, almost without intermission, the handling of the baffle plate was more than one man could do and fire the engine.

Shallow fire-boxes now appear to be the fad with some rail- roads. It is strange how we move in grooves and old things come to the front. When bituminous coal was coming into use as a fuel for locomotives, the idea was that a shallow fire-box was a necessity, and in some instances wood-burners were changed to coal by raising the grates almost to the fire door. Some engines built for coal by the Grant Locomotive Works had the bottom of the fire-box level with the top of the frames, but not over them. They were almost identical with the shallow fire-boxes of to-day.

They were soon lengthened out, some one at that early day of coal burning having discovered that coal could be burned with deep fire-boxes. The advantage claimed for the shallow fire-box, spreading over the frames, is increased grate area. It worries the average mind to know where the gain comes in when the number of square feet of heating surface that could be gained by a deep fire-box between the frames is taken into consideration. Also, as to where the increase of grate sur- face appears when the front of the grate is covered with a dead plate two or more feet wide to prevent cold air rushing up against flue sheets, starting the flues leaking. The distance from the bottom of the fire-box to the waist of the boiler being very short, the shallow fire-box is also a great institution for furnishing a supply of cinders and grit to eccentric straps and driving boxes.

While fully alive to the importance of ample grate area and slow combustion of fuel, I fail to see where the gain is without a proportionate increase of heating surface. A man would be considered a lunatic who would build a fire over a ten acre lot for the purpose of boiling a tea-kettle of water, yet this proportion is not so badly out when compared to some boilers lately described. The manipulation of the fire on anthracite coal requires a shallow fire-box. Mr. Wooten's clever device is the original.

Master mechanics have been much criticised for not ob- taining better results from the fuel consumed on locomotives in their charge. I believe they endeavor to get out of the coal all the heat there is in it, but are badly handicapped. They have no voice in the quality of coal supplied, as the purchase is made on a commercial, not a scientific, basis. As to final best results, coal may be sent to the road from two or three different mines, the coal from each mine requiring different treatment. One will need a fine grate, another more air space in the grate; one will give better results with a heavy, another with a light fire; one will clinker, another will burn to a clean ash. The master mechanic will work to strike an average not to get the best results from one grade of coal, but best general results from all. About the time he thinks he has the fuel question settled and he will take some comfort, he is rudely awakened with the information that "trains are all being laid out; engines will not steam." Investigation shows a new grade of coal has been furnished that requires different arrangement and treatment to burn. The coal purchased by railroads is known as "run of mines." The coal in these mines appears to be of a curious formation, the coal running in strata of fine slack and lump. When they get out railroad coal they strike the slack strata, but when coal for private consumers is mined, the lump vein is struck, thus again showing how "bounteous nature pro- vides"—for the coal dealer.

The man at the trolley and he with the shovel are im- portant factors in fuel economy. By nothing short of a sur- gical operation can the idea be got into their heads, that the throttle is not an expansion lever, that the quadrant and re- verse lever are for that purpose, or that regular and system- atic feeding of fuel with a regulated admission of air is the proper thing. They have a mania to see smoke rolling from the stack and actually try to produce it.

DEEP FIRE-BOX.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have noticed an article in the *Gazette* of the 27th, in which certain objections are urged against the use of the combustion chamber in locomotive boilers. These objections, I think, are founded upon experience with imperfect devices used in the past, and do not hold with the style of construction described and advocated in my previous letter. Some of the earlier devices used both abroad and in this country, were expensive and cumbersome.

The claim that a combustion chamber, being so far from the fire, the gases are consequently reduced to too low a temperature for perfect combustion, is, I think, not found- ed upon facts. Inspection of the fire in a locomotive boiler burning the ordinary soft coal, will show a very much larger per cent. of the flame reaching the tubes than is ordinarily supposed, even when there is additional travel caused by a brick arch. We will find, I think, that the extension of a combustion chamber, not exceeding 36 in. long, into the boiler shell, will show none of the adverse results claimed from too rapid cooling of the gases, and that in fact this distance is necessary in order that combustion of the gases

should be accomplished before entering the flues. Such a construction, by adding a certain amount, which can readily be calculated, of the best heating surface, and by allowing the gases to enter the tubes at a higher temperature, owing to more perfect combustion, will much more than make up, I consider, for the amount of flue surface we have cut off.

It is well known that in stationary boilers a distance of from 15 to 20 ft. is often needed for a flame way. In locomotives, owing to the more complete mingling of the atmospheric air with the coal gases, because of stronger draft, a less distance is required than in stationary boilers, but more is needed than is usually allowed in ordinary locomotive prac- tice.

I agree to the proposition that it is not advisable to put in a combustion chamber requiring much of an increase in the weight of the engine, or the outside length of the boiler, as the changing of patterns for the different parts of the ma- chinery, made necessary by lengthening the boiler, much in- creases the expense in first cost through such a construction.

The ideal boiler that I endeavored to outline in my previ- ous communication, was specified as having "the outside lines of the American standard type." This qualification it will be seen avoids entirely the disadvantages claimed by your article, of unnecessary changes and complications of the outside machinery, there being no changes in the outside boiler dimensions in the style advocated.

I think that some of the present devices for burning in ferior coals, whilst accomplishing their purpose economically as regards the results in coal used, do so at an expenditure of needless complication and expense. I have in mind now some engines that have been running for a number of years, carrying out in the main the general principles I have al- ready laid down that are working at an expense for fuel per mile run, of less than half the amount involved before they were changed to their present style of construction. This result is effected partly by the use of slack coal at about half the price of the lump coal formerly used, and partly by an increased number of miles run per ton of coal. These en- gines are free steamers, throw no sparks and make no smoke even when the slack coal is used.

I consider the present pattern upon which they are con- structed an expensive one, though their performance has cer- tainly been creditable as regards coal alone, and an adapta- tion of the same principles to the simpler device which I have before outlined, would, I have no doubt, give the most grati- fying results through more efficient working and high coal performance, while the cost of repairs would be but moderate.

C. M. HIGGINSON.

[Any comment on this letter must be deferred, but the main points are dealt with in the letter above from a well-known Master Mechanic writing over the *nom de plume* of "Deep Fire Box."—EDITOR RAILROAD GAZETTE.]

Notes on the Theory of Location.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Notwithstanding the fruitfulness of the topic, I will add but little more to my communication on this subject pub- lished in the *Railroad Gazette* last week.

Admitting that "curvature, not sharp, or so ill-placed as to limit the length or necessary speed of trains," and "rise and fall or elevations overcome by the engine on gradients not exceeding in resistance the maximum of the road," are "minor details of alignment;" the engineer will often be called upon to decide to which of these "minor details" he will give the greater value.

Two lines may be equal as far as revenue and reaching traffic are concerned. It would seem as if the shorter and straighter line should have the preference. In most cases, the owner would be best served by giving his customer the best service possible for his money, and subjecting him to the least possible unnecessary expense. One can hardly conceive how an engineer can insert an unnecessary additional distance, simply because the owner, who employs him, is expected to receive a profit in the operation of this additional distance, although he might be excused from hunting places to put his employer's money where it would be unproductive, simply to eliminate distance; that is, serve the public at the expense of his em- ployer. The chances are, too, that in the near future, when the characteristics of the line are to be improved, so as to increase its effective strength, undulations can be removed from the more direct line, even to the improvement of its ruling gradients, more readily than the same end can be ac- complished on the more circuitous route; with the advantage of adhering to the original right of way, after real estate becomes valuable.

In the west, errors have doubtless been made, by following too closely the course of streams, assuming that the valley contained the more productive territory, whereas in many instances they are subject to overflow, and are, at times, al- most inaccessible. Leaving out of view a water supply for sanitary and industrial purposes, the "divides" of the prairie are most valuable and productive, and these the di- rect line would most likely reach.

The valleys are usually deemed the natural courses of traffic, and it is taken for granted there is the place to build, the engineer not looking beyond its limits. A bold line across the drainage will frequently develop the unexpected.

A prejudice may destroy a well-matured plan. The writer once inherited, by succession, a piece of railroad location, on which was a single tangent 85 miles long. The line was an inexpensive one, with only some undulations of maximum grade, which was 40 ft. per mile. The territory traversed was not then deemed of much value in the production of

traffic, but was rather noted for the facility with which it could be passed over. There was certainly no valid reason for making a detour to secure additional business. Possibly time was squandered in securing such a result, and the mere ability to say that such a piece of line existed, was hardly worth the cost. This had, however, been expended, and was past recovery. It was taken for granted that a less direct line would be less expensive, and if longer, would secure more subsidy. The managing officer, too, was possessed of what is not uncommon with many in his position—a certain contempt for, and a disposition to disregard, the opinion of an engineer.

Having fully satisfied himself that the location of that 100 miles was all wrong because it was nearly defined as the "shortest distance between two points," he suggested to the new "engineer in charge of surveys" that he preferred a curve occasionally for the sake of steadying the train. He was met by no unnecessary argument, but only with a remark that there would doubtless be a stop every ten or fifteen miles at least. This would check oscillation of cars due to excessive length of tangents. He finally gave a peremptory order to break up that line, no better additional reason being assigned, except that there were some cottonwood trees on the islands of the Platte that he wished the line to approach. After two whole seasons had been spent in securing the new line, it was destroyed in two stormy winter months.

While it might have been no discredit to an engineer to have made the location originally, when the road was finally built there was no sound financial or engineering basis for the change.

"A railroad is a business enterprise and not a charitable institution, and has the same right as any private citizen, to take every reasonable precaution to secure pecuniary success. * * * The future returns to the investors are always more or less problematical, while the benefits to the public are not problematical, and always far ahead of any possible profit to the investors."

A railroad as a business enterprise must not claim for itself rights above those of the private citizen, and should be just as amenable to all the unwritten laws of trade; should be just as politic and furnish just as much courtesy to the dollar's worth of traffic as should the dealer in dry goods or general merchandise.

When the latter enters a new field, is without competition, and has everything his own way, even to the percentage of profit on his goods, he may be able to be a little careless of courtesy, and, as a partial compensation, will be a little liberal in making change—a dime or a nickel being about the smallest coin necessary in the transaction of business. Evidences of prosperity begin to multiply, and others appear to divide the business. It becomes necessary to be exceedingly polite to customers, the percentage of profit is materially diminished, and, finally, pennies are used in making change.

When what are now trunk lines were mere "stubs," extending 75 or 100 miles from the Mississippi into Iowa, and the only competitive traffic was in cattle and hogs that could be driven from one road to another; and for everything else each was secure of its share, truth compels the confession, that except to holders of "annuities," or the bearers of prods, whose "pass" was a stock contract, conductors and brakemen were not always careful in their attention to patrons. When the lines became "through," and competitors, the one that first discovered the value of an investment in courtesy became the favorite. The engineer, too, who has always been considerate in recognizing every individual right of a settler, and has paid liberally for any necessary damage to crops or property consequent upon making his surveys, has laid a good foundation for the popularity and, therefore, for the prosperity of his company.

"It is the peculiarity of curvature that all its disadvantages lie upon the surface, visible to every eye."

The tangent sometimes possesses the same peculiarity, and appeals more strongly to the imagination of the inexperienced than to the instructed judgment of the engineer. The writer has known a locomotive engineer complain of a "hard pinch" in the middle of a long tangent, on a maximum grade of 22 ft. per mile, with no bank heavy enough to involve a bad "sag." The long line in sight, in consequence of being straight, showed a good deal of absolute elevation. The effect, increased possibly by mirage, "appealed more strongly to the imagination of the inexperienced" than did the knowledge of the effective working capacity of his own engine.

Fast Long Distance Runs.

The accompanying table gives some particulars as to the speed, etc., of various fast runs made within the last few years, over distances of about 400 miles. It will be observed that all the trains are very light and that in only one case was the run made by a regular passenger train carrying passengers at ordinary fares.

Date.	Railroad.	Whence—Whither.	Gross.			Stops.		In motion.		Train.		
			Distance.	Time.	Speed.	Number.	Distance between average miles.	Time.	Speed.	Kind.	No. Cars.	Weight engine, tender and cars.
Aug., 1888.	London & Northwest, and Caledonian.	London—Edinburgh	400	7.5 ²	50.9	3	100	7.13	55.4	Regular.	4	*348,000 lbs.
July, 1885.	West Shore	E. Buffalo—Westhawken	432.6	9.23	45.0	12	35.2	8.17	51.0	Special.	3	311,000 lbs.
May, 1886.	New York Central	New York—Buffalo	440	9.30	45.3	7	7	7	7	Newspaper.	2	About 250,000 lbs.
June, 1884.	Baltimore & Ohio	Chicago—Bellaire	463	11.21	41.0	35	13.2	9.10	50.5	Special.	5	About 400,000 lbs.
May, 1876.	Pennsylvania	Jersey City—P'gh.	430.5	10.5	43.5	None.	430.5	10.5	43.5	Jarrett & Palmer.	4	About 320,000 lbs.

* The weight of the engines used differed considerably. The total weight given here is that with the heaviest engine and tender, which were used on the Caledonian, where the grades were steepest.

Tire Breakage on German Railroads.

The statistics of tire breaks on German roads up to the end of 1887, issued by the Imperial Railroad office, give the following results:

The railroads considered embraced 23,225 miles of line, upon which there occurred in 1887 3,552 tire breaks. For every 100 million miles run by an axle there were 55 breaks, against 76 in the previous year.

The improvement in the character of the tires is shown particularly by the following table of the breaks during the summer months of late years:

1884.	1,580	1886.	1,367
1885.	1,431	1887.	970

The breaks in winter have also decreased, but more irregularly.

Through the total breakages there were caused in 1887 20 derailments and 191 train delays; 395 breaks were discovered at once, the others after longer or shorter journeys.

In 2,881 cases it was possible to determine how often the wheel centre had had a tire put on. The result was as follows:

Disk wheels.	Spoke wheels.	For the 1st time.
In 504 cases.	In 1,288 cases.	
" 95 "	" 670 "	" 2d "
" 9 "	" 217 "	" 3d "
" 1 "	" 60 "	" 4th "
" " "	" 20 "	" 5th "
" " "	" 3 "	" 6th "
" " "	" 1 "	" 7th "
" " "	" " "	" 8th "

For every tire broken on a disk wheel there were broken on spoke wheels:

On the first term of service of the wheel centre.	0.64 tire
" second " "	1.70 "
" third " "	6.03 "
" fourth " "	16.50 "

The tire break in 1,883 cases, or 52.99 per cent., indicated good welds; in 34.15 per cent., defective, and in 2.5 per cent., bad welds. The chief causes of breaks were the following:

Defective material (absolute defects).	39.16 per cent.
Low temperature and change of temperature.	13.74 "
Brittle material.	13.65 "

In 620 cases the cause remains unknown.

The proportion of breaks in different kinds of rolling stock was as follows:

Tenders.	0.5 per cent. of all wheels used.
Locomotives.	0.47 "
Mail cars.	0.38 "
Passenger cars.	0.35 "
Baggage "	0.33 "
Freight "	0.22 "

More than one-third of the broken tires were used under brakes.

For every 10,000 tires in use the breaks were as follows:

In tires with brakes.	1887.	1886.	1885.	1884.
" without brakes.	27	34	34	27
" "	23	32	25	20

The tendency is towards the use of cast steel (flusstahl), of which there were, in 1887, 873,381 tires, an increase of 4.52 per cent., against 134,615 puddled steel, and 61,863 forged iron tires.

The following table shows the increase in the thickness of tires of late years:

Year.	In every 1,000 tires there were:						
	Over 2.36 in. thick.	2.36 to 2.50 in.	2.50 to 2.64 in.	2.64 to 2.78 in.	2.78 to 2.92 in.	2.92 to 3.06 in.	Under 0.97 in.
1884.	153	239	223	114	79	49	19
1885.	186	273	250	131	85	50	18
1886.	205	318	293	142	91	50	14
1887.	221	328	288	141	88	49	12

[The table is as given in *Glaser's Annalen*, and is an unfortunately defective for purposes of comparison, as the totals in each year do not foot 1,000 in any case.]

Coupon Ticket Accounts.

The following is an abstract of a paper read at the meeting of the Association of American Railway Accounting Officers in New York city, July 26, by M. Reibenack, Assistant Controller of the Pennsylvania Railroad.

Mr. Reibenack begins with a brief historical account of coupon tickets. The first meeting of American general ticket agents was at Pittsburgh in March, 1855, where representatives of various lines east of the Ohio River met to discuss the various complications incident to the interchange of passenger business which had arisen. The call for the meeting stated that it was for the purpose of "agreeing on a uniform system of through tickets." The second meeting was held in Boston in April, 1856, at which a committee was appointed to prepare a general plan for coupon ticketing. Mr. Reibenack then details the progress from the original form, which was merely several tickets printed on one sheet, each one being a separate contract, and without consecutive numbers, to the modern form of contract, which has been subjected to

so many correcting and finishing processes, as the result of experience. Before the use of L punches, the date of the stamp on the back was used to define the limit. At the Cleveland convention, in March, 1882, a resolution was passed that all consecutive numbers should be properly reported. Mr. Reibenack then goes on to detail the proper system of keeping the accounts of coupon tickets in the general office, enumerating the various books and blanks necessary, and briefly explaining the special uses of some of them as exemplified in the practice of the Pennsylvania road. He continues:

For the purpose of apportionment of earnings we use, in addition to the regular books for the purpose, a consolidated book which reduces the detail entry to a considerable extent. In consolidated apportionment books the sales of various offices are entered as one item taken from a consolidated list made up of such tickets, and one extension of money made; this list is furnished passenger department for divisions instead of the separate reports. The time saved by using consolidated books is fully one month or more for one man on the work. In making up reports to foreign roads from consolidated books the consecutive numbers are taken from the agent's reports.

Ledger accounts are kept with each foreign road, and in these accounts the number of passengers, as well as the amount of money, is entered, this being useful for statistical purposes. Mr. Reibenack has a regular printed form for sending notice to agents of tickets that are to be withdrawn from sale or returned to headquarters, and also one for notifying the conductors and foreign roads of lost or stolen tickets. He goes on to give the following interesting facts concerning the work of his office:

A comparison of our coupon ticket business for the years 1869 and 1888 shows that it is possible for us at present to ticket passengers to three times as many points as in 1869, although the number of forms on sale is not much greater. This is partly due to the invention of Davis and other patent tickets adopted a few years ago, which reduced the number of forms of tickets without restricting, and in some cases enlarging, the limit of territory to which agents could ticket passengers. On the Pennsylvania Railroad system it resulted in a reduction of about 4,000 forms. The combination ticket was also another saving in this direction, which allowed one form of ticket to answer for unlimited or limited and second-class business, and permitted the recalling from our agents all limited and second-class tickets with the exception of a few special forms.

Our apportionment books have increased from twelve books, containing 52 pages, in 1869, to twenty books, containing 345 pages, in 1888. This would be still further increased to the extent of 100 pages were it not for an improvement made in the manner of handling the sales from offices in one city to other common points by reason of our consolidated books. From the agents' reports is made a consolidated list of all offices selling to a certain point, say Chicago, and the aggregation of such sales entered as one item, and the offices participating being noted opposite in small columns provided. By this means but one entry and distribution among the different roads is required, while the old system might require from 10 to 15, involving considerable increased time and labor. The clerks necessary to our apportionment system were 5 in 1869, as against 17 at present. Likewise, our ticket accounts with agents were in 1869 kept by two men, as against 13 now. In the former year there were 227 agencies selling coupon tickets, as against 710 in 1888, with large increase in territory to which passengers may be ticketed. The amount of our sales of coupon tickets in 1869 averaged \$450,000 a month, while at present it is about \$900,000.

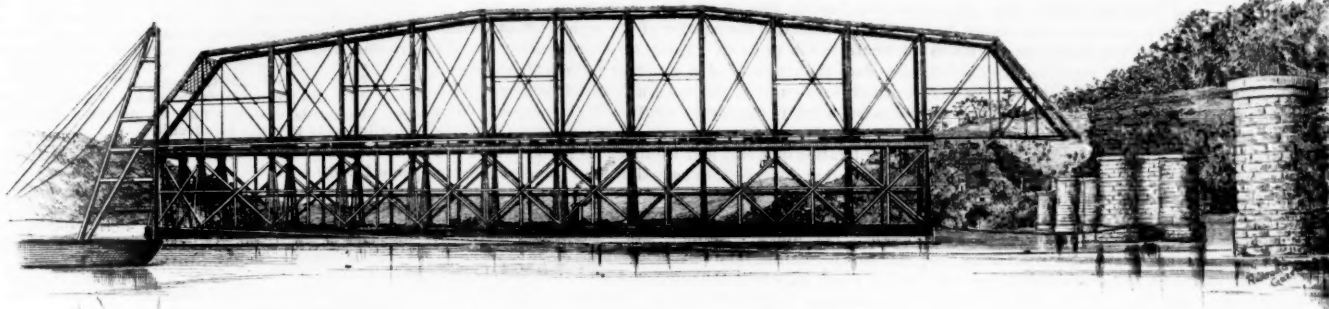
The clerical force has not increased in proportion to the increase in business. The reasons for this are in a great measure due to the large reduction of forms of tickets, as well as to the advanced methods, the outgrowth of experience, by which we are enabled to conduct our business with greater dispatch and more economically than in former years. Had, however, no change been made in the methods existing in 1869, it would require a force of 44 men to do our apportionment work, as against 17, and for our records with agents 36 men, as against 17.

Mr. Reibenack closes with various suggestions for the improvement of this branch of the business, among which are recommendations that a uniform date be fixed upon for rendering reports to foreign roads, and for various uniform blanks.

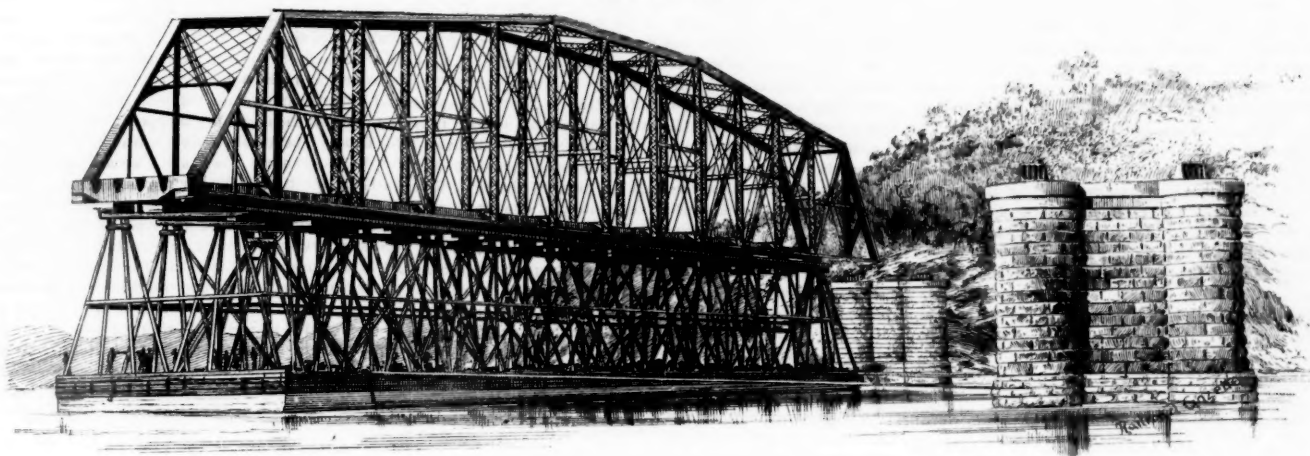
Placing the Centre Span of the Hawkesbury Bridge.

In erecting the Hawkesbury Bridge it has been considered impracticable, owing to the great depth of the water and mud, to use false work, and therefore the bold expedient has been adopted of erecting the spans on pontoons, something more than 3,000 ft. from the bridge site, towing them to place, and dropping them on to their seats as the tide falls. The illustrations in this issue show the operations as successfully carried out with the middle span May 25, 1888.

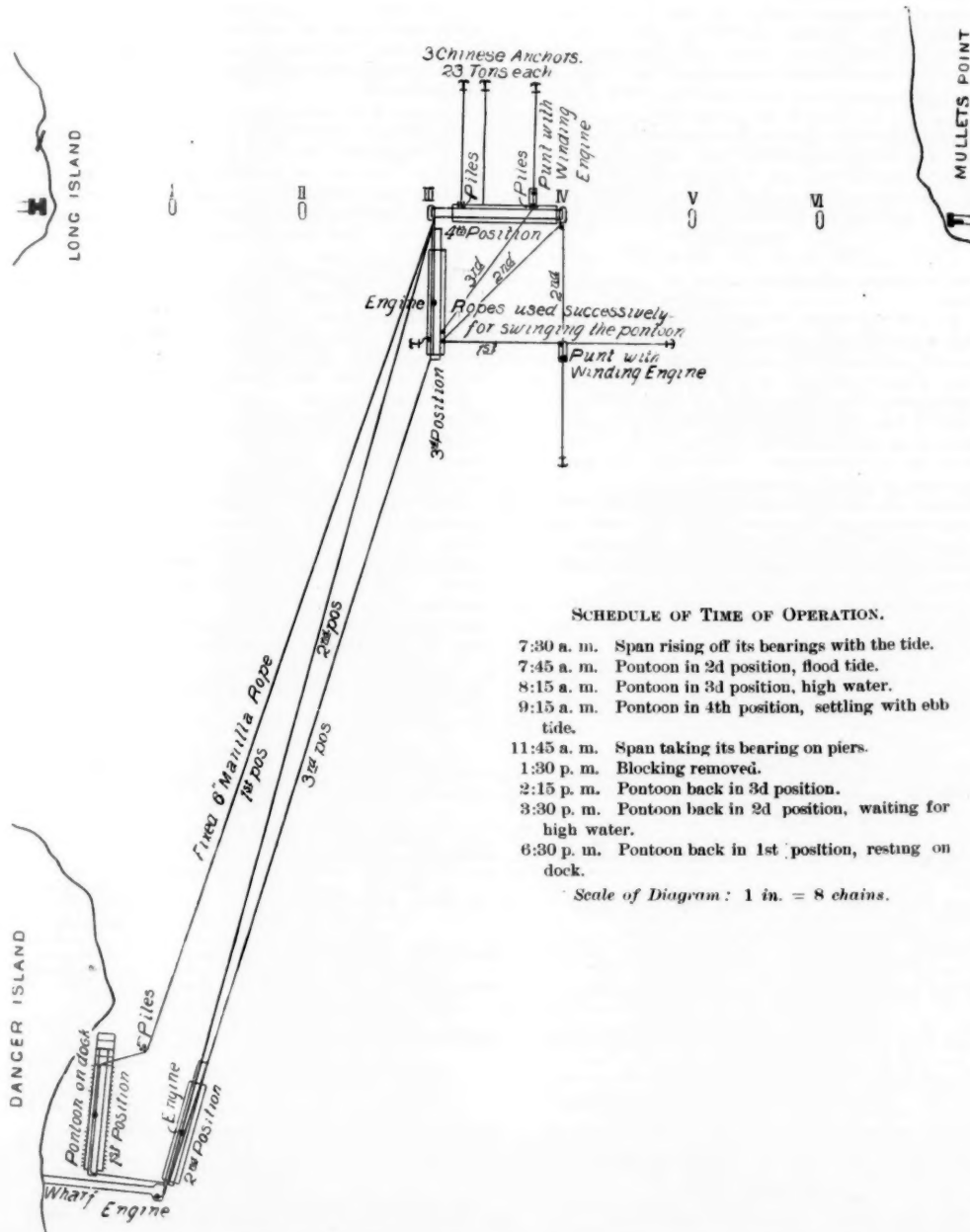
The pontoon which is shown will be used also for the other spans. It is 335 feet long, 61 ft. beam and 10 ft. deep. The bridge span is 415 ft. over all, and therefore overhangs the pontoon about 80 ft. The length of the pontoon was limited by the water-way available for the shore spans. No particular effort was made to secure stiffness in the construction of the pontoon, as it rests upon a pile platform during the erection of the false work and the bridge spans. When the time came to float the pontoon it was emptied at low tide, the valves closed securely to prevent its filling again as the tide



Third Position



Between Third and Fourth Positions.



SCHEDULE OF TIME OF OPERATION.

- 7:30 a. m. Span rising off its bearings with the tide.
- 7:45 a. m. Pontoon in 2d position, flood tide.
- 8:15 a. m. Pontoon in 3d position, high water.
- 9:15 a. m. Pontoon in 4th position, settling with ebb tide.
- 11:45 a. m. Span taking its bearing on piers.
- 1:30 p. m. Blocking removed.
- 2:15 p. m. Pontoon back in 3d position.
- 3:30 p. m. Pontoon back in 2d position, waiting for high water.
- 6:30 p. m. Pontoon back in 1st position, resting on dock.

Scale of Diagram: 1 in. = 8 chains.

rose, and at high water it was afloat. The rise and fall of the tide at this point is from 5 to 7 ft.

The method of handling the pontoon is indicated in the diagram showing the relative positions of the towing rope, the winding engines and the anchors. It will be seen that it was hauled out into the stream by tightening the cable, which was deflected around the clump of piles in the stream. When the pontoon was afloat in what is indicated in the diagram as the second position, the slack of the cable was taken up by the winding engines and the craft was towed up to the third position by the engine and drum on the pontoon itself. Here the cables from the punts with winding engines, which are shown in position on the diagram, were attached and the pontoon swung to the fourth position, where it was secured against any movement up stream by the piles against which it rested, and against movement in the other direction by the cables attached to the Chinese anchors.

The position of the span having been carefully adjusted, it was allowed to settle to its seat with the falling tide, and when it was secure the blocking was removed and the pontoon floated back to its original position, ready to receive another span.

The rapidity with which the whole operation was performed was remarkable. It will be seen that from the hour when the pontoon began to float, until its return to the position from which it started, but 11 hours elapsed, and of this time 3 hours were consumed in waiting in the second position for high water to enable the pontoon to be brought back to the dock. The time-table of the various parts of the operation is given underneath the diagram.

The spans weigh about 1,000 tons each; and, when afloat, the bottom chord is 45 feet above the water, and the highest part of the top chord 110 feet.

Mr. Charles McDonald, of the Union Bridge Co., who has just returned from Australia, reports the work on the last pier as fast approaching completion. The erection is under the immediate charge of Mr. S. V. Ryland, who superintended the erection of the cantilever at Niagara for Messrs. Field & Hayes.

The Need of the Southwest—A Deep Water Port for Texas.

BY LEWIS M. HAUPT, C. E.

In these days of trans-Isthmian agitation it becomes interesting to recall the early history of the Spanish occupation of that portion of the country then forming a part of Mexico. The engineering projects of to-day contemplate the passage of the isthmus by two water-ways and one ship railroad, but before steam became a potent factor in transportation and when animals were the principal means of locomotion, an active inter-oceanic trade existed over the portage extending from Corpus Christi Bay on the Gulf of Mexico to San Diego on the Pacific Ocean. Numerous relay stations of adobe were built on this line, some of which are still preserved as shrines for the service of devout Catholics. Built by unskilled labor and of the crudest kind of material, they are wonderful monuments of endurance and exhibit great fertility of resource on the part of the missionaries who are supposed to have designed and executed their construction more than three centuries ago. But this chain of missions has more

than an engineering or historic interest. It is strategic. These cathedrals were also fortresses and trading posts, placed on the line which, in those days, commanded the largest tributary country, was the most salubrious and which could be readily traversed. This route connected the nearest deep water port on the gulf with that on the Pacific. To-day the physical conditions are substantially unchanged, excepting that the unceasing southward progression of the sandy islands inclosing the lagoons of the Texas coast has caused the harbors to deteriorate to so great an extent as practically to close and barricade the eastern entrance and destroy the trade of this once favored route.

In the rapid growth of the trans-Mississippi region the time has come when its citizens are crying for relief from the long haul to the eastern seaboard, and are looking for and demanding the opening up of their natural outlets to the sea by way of the Gulf coast. The area tributary to this outlet embraces over 1,000,000 square miles, and the question assumes a vast national importance, therefore, not only as an economic problem for the territory east of the Rocky Mountains, but as a trunk line between the continents of Europe and Asia via the United States.

The distance from New York to San Francisco is 3,250 miles,* while the overland distance by the old Spanish route is but about 1,200; consequently the saving in rail transportation may be reduced by about 2,000 miles. If the relative rates on cereals by rail and ocean be taken as a basis, then at an average of 5.08 and 0.77 mills, respectively, the saving per ton per mile would be 4.31 mills, and on the 2,000 miles, \$86.20 per ton. This would pay for 11,200 miles of ocean transportation at the above rate, and gives some idea of the importance of reducing the rail distances wherever practicable.

The following comparison of distances by the transcontinental routes will still further illustrate the advantages of the Gulf line.

Transcontinental Lines of North America.

	Miles.
Canadian Pacific, Port Moody to Montreal.....	2,994
Canadian Pacific, Port Moody to Portland, Me.....	3,261
Northern Pacific, Tacoma to New York (via Cascade Div.)..	3,253
Union Pacific, San Francisco to New York.....	3,318
Via Atchafalaya, Topeka & Santa Fe (San Francisco to New York).....	3,463
Southern Pacific (San Francisco to New Orleans).....	2,495
Gulf or Mexico Pacific (San Diego to Aransas), about.....	1,200

The latter being only two-fifths or forty percentum of the shortest. The overland distance, via Southern Pacific, from San Monica to Corpus Christi is 1,600 miles, and this would get the traffic.

From Hong Kong to Liverpool the estimated distance by existing routes will average about 12,000 statute miles. As Hong Kong, the Sandwich Islands and the Florida Straits are on the tropic of cancer there would practically be no increase in the total length of the line between these termini, but the percentage of distance by land, and, consequently, the rates, would be materially reduced.

The one thing needful to secure these important results is to remove the barricade to the ports along the Texas coast, and to restore the harbor entrances to their original depth. This is not so simple a matter as it would seem, and it has been attempted by the Government for the past twenty years or more, but, under existing methods of administration, with little practical success. The citizens of that section are therefore moving by mass meetings, conventions, publications and petitions to obtain a more energetic application of a portion of the surplus to these legitimate and greatly needed improvements.

As an engineering problem it may be of interest to note some of the physical conditions existing at the several points on the Texas coast where it is thought suitable harbors might be obtained. For this purpose the appended tabular exhibit, prepared for the Fort Worth Convention, will show in the most succinct manner the main elements with sufficient accuracy to convey a fair idea of their relative importance and the success thus far attained, with the amounts expended and estimated to complete.

This table contains much food for reflection, but there are several points which it demonstrates forcibly. The first is that the area of the fresh water basins in this section has

little or no influence in maintaining the depth over the bar. Second, that the area of the tidal basin inside the gorge, as well as its form and the position of its outlet, are important elements in the problem. Third, the comparative surveys also show the existence of a resultant force which causes a southerly movement of the passes at a rapid rate, and which furnishes a key to the speedy solution of the problem. The table also gives a direct answer to the questions as to the proper location of a safe and commodious harbor which can be obtained at least cost, in least time, and be most cheaply maintained.

The present resources of the profession in creating channels over bars appear to be limited to jetties, aided by dredging, sluicing-basins, tidal reservoirs and other expensive works which have invariably resulted in extending the jetties and requiring frequent dredging. Without entering into a discussion of the defects and difficulties in the parallel or convergent, high or submerged jetty systems,* it will suffice to state that they are intended to concentrate the ebb discharge upon a certain part of the bar and so remove the sand which the flood-tide and waves have rolled against the inlet. In general, it will be found that this beach sand is moved in a resultant direction, which indicates that of the controlling forces, and it is manifest that if this sand can be kept out of the channel, while at the same time the flood tide is admitted, the result should be beneficial; also, then, an engineer who would attempt to restrain the sand movement by an obstruction placed on the farther side of the navigable channel would place himself in the position of one who would erect snow fences to the leeward of a railroad cut to keep out the snow. The effect would be to fill the cut as rapidly as possible. Any current through it would merely add to the accumulation at the outer end and increase the cost of creating a channel. It is freely admitted that the sands of the Texas bars are rolling southward at the rate of at least 200 ft. per annum, yet the approved plans for the improvements of the entrances at Galveston, Cavallo and Aransas show the first jetties built, or being built, to be those on the far or south side.

As the appropriations have been doled out piecemeal, the jetties have remained submerged for so long a time that they have been in large measure destroyed by the cross-currents they have produced and by the terebo. This may be regarded as rather a fortunate circumstance, however, since it has limited the bodily progression of the bar gulward, and so reduced the ultimate length of the jetty to some extent. At Galveston the shrinkage was 61 per cent. of the original volume, and the bar has receded about one mile. It is now nearly or quite five miles to the outer 30 ft. contour. During the continuance of these works there have been at least three changes in the officers in charge, and probably more, and the appropriation bills have failed even more frequently. These are some of the reasons why this section of country has remained so long in a state of nature, and reveal some of the defects of the present methods of administration which the Cullom-Breckenridge bill is designed to remove.

ARANSAS PASS.

A brief sketch of this entrance will be found instructive in this connection as indicating the proper course to be pursued.

Prior to the cession of Northern Mexico to the United States, the Mexican Government made a survey of this port in 1832, and found 20 ft. as the depth on the crest of the bar. During the years from 1837 to 1839 the pilots reported from 17 to 18 ft. depth. In 1868 the depth had receded to 9 ft., and the inlet had moved some 2½ miles southward of its position in 1839.† This would be at the rate of over 400 ft. per annum. "The depth was temporarily increased in 1869 by placing obstructions in the N. E. channel over the bar, but subsequently decreased, until 1878, when the Morgan ships were withdrawn, being unable to cross the bar." The obstructions of 1869 contain an important sequel which appears to have escaped attention, for in reporting on this pass Captain Howell says:‡

"In 1869 work was begun by private enterprise to im-

*See Franklin Institute Journal, April, 1888.

†See paper on "The Deep Water Port of Texas," by Col G. W. Fulton, published in the Denver Chamber of Commerce, July 7, 1888.

‡Report Chief of Engineers for 1880, vol. II., pages 12, 61, et seq.

prove the channel through the bar by running out lines of jetties from the Saint Joseph's Island shore to cut off a secondary channel near this shore. * * * They were expected to act as a nucleus, about which sand would accumulate and close up the secondary channel, thus diverting the flow of the water directly through the channel on the bar. From the fact that the secondary channel had shoaled about 2 ft. and the main channel had deepened about 2 ft. since placing the crates, it may be supposed that they have contributed to produce this result."

In commenting on this extract, a Board of Engineers say (page 1,266):

"It is stated that a pier of 600 ft. in length, constructed in 1869 from the end of St. Joseph's Island, caused the temporary deepening of Aransas Bar. It is not clear how such effects could be attributed to the structure, unless, as Lieut. Woodruff reports, it was instrumental in closing a swash channel then existing."

Thus [this short 600-ft. jetty on the north side built of "crates" and at private expense did produce a beneficial effect by obstructing the sand moving southward into the main ebb channel, while at the same time it did conserve the energy of the ebb discharge by preventing its wasting over that part of the bar. In fact its action was similar to that of the "stone fleet" sunk on the Charleston Bar to obstruct the entrance, and which unexpectedly resulted in forming a new and better channel than before by the protection afforded to the ebb and the resistance it opposed to the sand rolled up by the flood. The lesson, however, was lost to the government, for in continuing work at Aransas the south jetty was partially built and the bar advanced, as should have been expected so long as the sand was permitted to encroach from the north side. In all of these places, the writer believes it possible to recover the original depth of 50 ago years by a single breakwater of less than half the length required under the present plans, placed on the "flood" side of the channel, and having such a form as to cause the sand which it carries to be precipitated in a pocket, where it will form a harmless deposit or middle ground such as is found in nature.*

These brief statements of facts suggest their own conclusions, as our space is too limited to enter further into the details of the plans or the necessities for the improvements.

Cup Wheel Automatic Variety Grinder.

This machine is designed for grinding flat surfaces of moderate width, such as steel dies of great variety, keys, iron planes and any article with straight edge or flat face.

The grinding is done on a front edge or rim of the cup wheel, which grinds the work flat and true. It has a three T slotted table 9 in. wide, on which chucks, angle irons and various arrangements can be placed, adapting it to do a large variety of work.

Both ends of the table are advanced or fed forward equally at the same time by means of bevel gears and connecting rod. The carriage runs on a dovetail track of good width, gibbed to take up wear, and can be instantly stopped by dropping the worm out of gear without shipping any belts or stopping the wheel, a convenience in putting on and taking off work. The worm and worm gear are run in an oil dish to prevent wear.

The machine has galvanized pans on the carriage under the table and one under the wheel that catches the water used and conducts it into a cast-iron tank located under the machine out of the way. A centrifugal pump is attached to one of these tanks, piped so that plenty of water is supplied to the wheel, with a valve to regulate the amount of flow.

The pump furnishes a large supply of water, prevents heating and drawing the temper, and grinding can be done much faster than when run dry. Moreover, it prevents loose emery flying on the working parts and on the neighboring machinery.

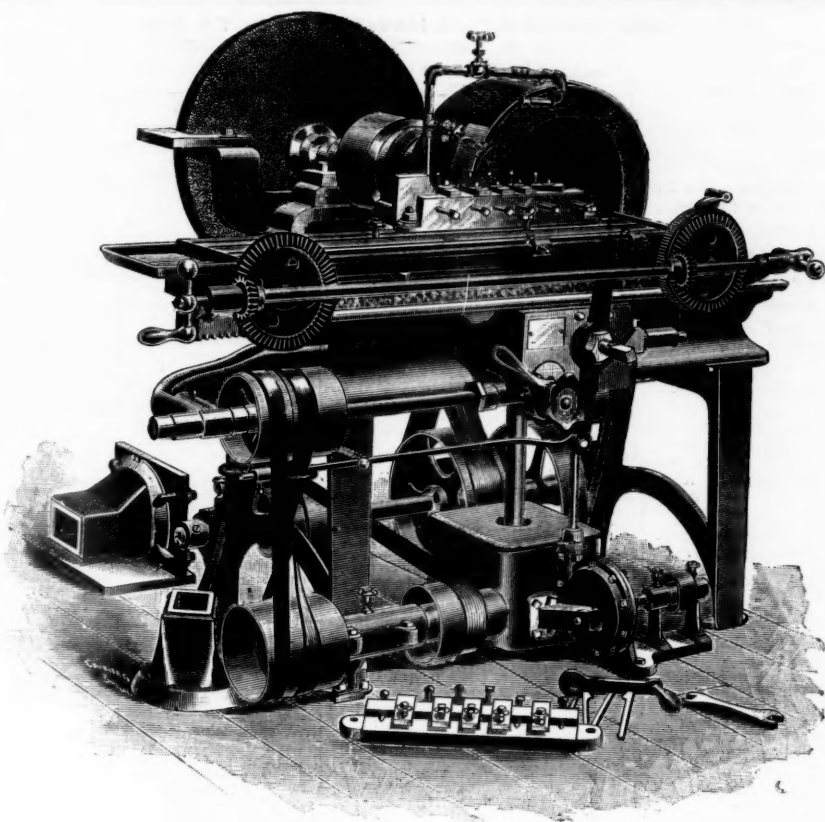
Seven sizes of these machines are made, and can be furnished to do work from 1 in. to 12 ft. long. A large wheel, as shown in the illustration, can be used on the back end of the spindle for dry grinding of miscellaneous work. It has 1½ in. steel spindle, bearings 8 in. long, with spindle pulley 8½ × 5 in. The emery wheel is 16 in. diameter, 8½ in. deep outside measure, with 2 in. rim, and is large for a cup wheel, being equal to one 26 in. diameter by

*"The Physical Phenomena of Harbor Entrances; Their Defects and Remedies." Published by the American Philosophical Society, Phila.

* Post-Office Guide.

NAME OF RIVER BASIN.	Tributary area in sq. miles.	Relative area.	Area of inner bay or tidal basins...	Relative areas of tidal basins.	Name of pass.	Width of pass.	Mean rise of tide...	Distance to crest of bar...	Dist. from mouth of river to "gorge" of bay...	U. S. C. S. Depth on outer bar in ft., referred to mean low water.	According to latest surveys.	Total expenditure.	Estimate of cost to complete.	Resulting depth...	Harbor capacity inside of gorge having depth of 20 ft.	RESULTS. See Appendix T, Report of the Chief of Engineers for 1887.
Sabine River.	22,000	1.44	Sq. miles.	.....	Sabine Pass.....	Ft. 2,100	Ft.	Miles 2.70	Miles.	Ft. 6¼ in 1884.	Ft. 8 in June, 1886.	\$507,668.77	\$2,301,250.00	Ft.	Acres.	.....
Trinity River	24,500	1.62	450	2.25	Galveston.....	9,000	1.1	4.00	17	12½ in 1884.	12¾ in March, 1887.	\$1,581,782.84	\$6,700,000.00	{ 25 or 30 }	270	{ It has resulted in deepening the water over the outer bar to about 12½ ft.
Brazos River.	38,500	2.54	.....	.....	Brazos River...	600	1.1	0.38	0	8 in 1858.	5½ in April, 1887.	\$140,833.94	\$364,000.00	.....	.....	{ "It has resulted in deepening the water over the outer bar to about 12½ ft.
Colorado River ... }	37,000	2.42	{ Abt 500 }	2.50	Pass Cavallo.....	9,000	1.1	2.00	16	8 in 1874.	10 in July, 1887.	\$290,095.16	\$1,366,780.00	12	1,350	{ "It has not as yet resulted in any useful effect upon the bar."
S. Antonio River..... }	15,000	1.00	200	1.00	Aransas Pass....	3,000	1.1	0.75	25	6½ in 1875.	*8¼ in May, 1887.	\$393,556.95	\$1,571,293.72	12	250	{ "It has resulted in checking the southward movement of the Pass."
Nueces River	17,800	1.18	250	1.25	Corpus Christi..	1,300	.....	1.00	34	.....	4½ in 1887.	.....	.....	.....	.....	{ Nothing has been attempted at this point.
Laguna de la Madre. }	.....	.....	.....	.....	Brazos Santiago.	1,200	0.7	0.50	60	7 in 1867.	7½ in August, 1887.	\$185,204.17	.....	.....	.....	{ "It has not as yet resulted in any useful effect upon the bar."
Rio Grande..	287,500	19.00	.....	.....	Rio Grande.....	600	0.9	0.50	0	3 in 1854	.....	.....	.....	.....	.....	.....
												\$3,009,141.83	\$12,303,323.72			

* Texas papers give the present depth at 10½ ft. (1888).



CUP WHEEL AUTOMATIC VARIETY GRINDER.

Made by the SPRINGFIELD GLUE & EMERY WHEEL CO., Springfield, Mass.

1½ in. thick of the common kind. The emery wheel rests on a carriage running over a back extension to the bed, and is fed forward on a dovetail track, as the wheel wears away, by means of a hand screw, from the back side of the machine.

This machine is made by the Springfield Glue & Emery Wheel Co., Springfield, Mass., from whom any further particulars can be obtained.

Steel Rails—Conditions of Manufacture which may Influence their Life.

In speaking last week of rails and their tests we called attention to the suggestions of Mr. F. A. Delano for a series of comprehensive observations to be made by railroad companies. The interest in the subject expressed by several readers leads us to reprint at length Mr. Delano's paper. His suggestion for observations of actual performance in the track are as follows:

A vast amount of money has been thrown away in making analyses and physical tests of rails about which little or nothing was known, and after the study of records upon records of analyses which only seem intended to bewilder and confuse, I feel justified in saying that a small part of this money judiciously spent would have given us an immense amount of valuable information which we now lack. If every large railroad company in this country should begin now, and, choosing one rail in every thousand tons ordered, make some practical service-tests, we should begin in a couple of years to learn something about our subject. The clause which I would suggest including in rail-contracts would be: "The representative of the railroad company shall pick out one rail for every 1,000 tons, or fraction thereof ordered (on which is distinctly stamped the heat number), and this rail shall have 1 ft. in length sawed off cold from each end. The 28 ft. length shall be *daubed* (on the web and flanges) conspicuously with paint, and the short pieces stamped so that it will be known without possibility of error from what rail they have been cut, and to which end they belong. The painted rails and the short pieces shall be kept together by the rolling-mill company until the completion of the order and then forwarded to the railroad company."

My idea would be to test all the 28-ft. (painted) rails of one year's make by putting them at one time into a piece of track where they would have practically identical service, and where they could be watched. Any additional refinements which could be added—to record the numbers of trains, the tonnage, etc., would be of great use; but even without them much could be learned by simply watching the comparative wear.

The short pieces could be tested in various ways, either at the outset, or after the track-test was complete. An etching of a planed section would show roughly the part of the ingot from which that part of the rail was rolled, and there would also be the opportunity for making tensile and torsion tests with specimens prepared from the head, web and flanges, and chemical analyses from the specimens themselves at their point of fracture, which would give us some right to compare physical properties with chemical composition.

Mr. Delano states and discusses briefly, as follows, some of the conditions which may greatly influence the service of rails:

I. *Uniformity in the quality of the material charged into the converter assists the attainment of uniformity in the steel produced.*—This is the argument which is used by the champions of the cupola-melting or indirect process, and has considerable weight. It takes vastly more skill to make good steel if there is a great irregularity in the iron charged into the vessel than if there is not this irregularity; but, on the other hand, there are certain advantages in the direct method, such as a lower sulphur percentage from the same furnace iron, while it is possible to get as great uniformity

in the iron charged by having the furnace capacity enough in excess of the demands from the converting department, to allow for occasional "slips" in the furnaces, and permit the mixing of the iron from two furnaces which are respectively too "hot" and too "cold."

II. *Care in pouring ingots at the proper temperature into warm molds, and the treatment of ingots before rolling, have important effects on the rails made from them.*—In other words, many of the failures in rails and the uneven wear of rails are often traceable to bad ingots, which may result from careless pouring, spattering the sides of the molds, or stopping partially or entirely the flow of metal from the ladle to the ingot. Cold molds produce "flaws" and "checks" in ingots, and the use of molds so hollowed and burnt as to require a hydraulic ram to push out the ingots also does it.

III. *Increasing the diameter of rail-ingots may be a positive injury.*—(a.) The pressure between the rolls should increase as the square of the diameter if large ingots are to be forged as thoroughly as small; yet by driving the rolls more slowly their effect can be made to penetrate more deeply to the centre of the ingot. (b.) The amount to be cut from the top of the ingot to reach soundness is by weight a certain percentage of the cross-sectional area, and therefore must increase as the square of the diameter. (c.) Increased height, within practical limits, gives an increased amount of metal that is sound, since the soundness of any part of the ingot should be proportional to the weight of the metal above it.

In these three ways, I think, the proportions of ingots have an important influence. First, that the power of the forging press, the rolls, or the steam-hammer must increase certainly with the area of cross-section or as the square of the diameter, and that, unless this is done, the forging effect is superficial and not thorough. With rolls this effect can be made to penetrate more deeply by simply allowing more time for the pressure to be transmitted through the semi-rigid mass, i. e., by slower rolling. With high-speed rolling the effect is like that of a light, quick-striking hammer, and an index of its superficiality is to be seen in the hollow, cup-shaped ends.

Second comes the question of the amount necessary to cut from the top of the ingot to reach soundness, and how this is affected by changing the proportions of ingots. The distance from the top to which the central funnel-shaped cavity and dispersed honey-combs will extend (conditions being equal), is about the same, irrespective of the cross-sectional area, and hence is by weight proportional to this area, or varies as the square of the diameter.* It seems but reasonable that if we keep the top of the newly-poured ingot fluid as long as possible (as by throwing on charcoal or coke-dust), and keep the ingot erect until the fluid interior has solidified (most easily done by heating in furnaces in which it stands in the same position as it was poured), we shall enable this cavity and general unsoundness to exist near the top; whereas, if by throwing on water or by "stoppering" we solidify the top of the ingot, we shall oblige the unsoundness to exist further down in the ingot. Third, it seems but a corollary to this proposition that the soundness of any part of the ingot is roughly proportional to the height of metal above it. This theory could not be pushed to extremes, since there are sound, practical reasons against making the mold too tall and slender.

IV. *Rolls intended for the blooming of ingots by rapid reduction at each pass† (1) should be larger in diameter in proportion as the reduction per pass is larger; and (2) should be designed (as, for example, universal or "V" shaped rolls) so as to support the metal on all sides during*

* At most mills, the bloom goes to the shears "top" end first, which seems to me so wasteful that I speak of it here. Even granting that the "bottom" end needs some trimming, it would be better to trim that first, and then cut off the amount left over at the top instead of cutting from the top end first, which not infrequently results in wasting more from the bottom end than has been cut from the top.

† The only way to compensate for the loss of time resulting from reducing the speed of rolls, even to one-fourth of the present speed, would be to decrease the number of passes; for instance, doing in 5 or 6 what is commonly done in 10 or 12.

the rolling, and thus prevent the formation of little cracks and tears in the unsupported part.

The first statement is reasonable and needs no explanation; and in regard to the second, I think I am speaking within reasonable bounds in saying that, as rolling is more rapid, or as the amount of reduction per pass is greater, the width of unsupported metal between the collars is more subjected to cracking and tearing. This trouble would be overcome, I think, by "V" rolls; but I confess I have never seen the experiment tried, and may be mistaken.

V. Rolling long-length rails certainly lessens the waste, and a mill rolling long-lengths can better afford to throw away a long rail-end at the top than a mill rolling short-length rails; but besides this, it influences the temperature at which rails are finished, though the coolness at which it is possible to finish rails of the existing type of section is really limited by their shape. This brings me to my fifth proposition—that the hot rolling of rails necessitated by the present shape produces a rapidly-wearing rail. This hot rolling and extremely hot finishing produces a metal loose in structure; and the head of the rail, particularly hot when finished and cooling very slowly, is on this account rapidly worn away as soon as the outer skin is worn off. Already the weight on the driving-wheels of many locomotives is sufficient to "squash and flow" the metal in the railhead of many of the rails manufactured nowadays, and there are only two ways in which this trouble can be met—which brings me to my sixth proposition.

VI. *The only way to materially increase the life of rails involves a change in the ordinary type of rail-section, in order to (1) increase the bearing-surface between the wheel-tread and the rail, so diminishing the weight per square inch; (2) to increase the hardness or, more accurately, the compressive strength of the metal (a) by increasing the compactness or physical hardness of the metal (only possible by colder rolling), or (b) by increasing the chemical hardness (only possible, with safety, in a section less liable to internal strains).*

It is evident that it will be of little use to increase the width of our rail heads unless there is some change in the shape of locomotive tires; for, of the eighty or more different types in this country, only a few when newly turned up get a bearing across the entire width of present rail heads, and the shape of many rails, taken out of track, attests the condition of the tires, and proves that the rails were worn out before their time while acting as grindstones on which the tires have had their "coning" worn down to an even bearing.

Many engineers have calculated the strength of their section on the assumption that the metal in all parts of the section was of equal strength, as if a rail had been planed out of a rectangular bar. What better instance that they had done so do we need than the experiments (so much talked of) made by the late Von Weber, of planing down a ½-in. web to ascertain what would be a safe minimum thickness? Much, too, has been sacrificed to make a rail for the joint, a sacrifice well worth making, perhaps, if a good joint be unattainable otherwise. The important thing is to know how much we are sacrificing, and how much we are getting for our sacrifice. I can but think that if engineers realized the sacrifice we should see a splice-bar devised which would be as good as the best and yet suited to the best form of rail.

In the question of hardness as affecting the life of rails, first brought into prominent notice by the careful investigation of Dr. Dudley, there seems to have been no distinction made between the two different kinds of hardness—that which results from greater compactness of the metal, which I shall call *Physical hardness*, and that which comes from the chemical composition, which I shall call *Chemical hardness*. Supposing the surface of a rail to be in reality rough, resembling, when much magnified, a roughness like that on the soles of rubber over-shoes, it is conceivable that these roughnesses should be so brittle as to break off, but it is clear that the greater the physical hardness the greater will be the tenacity and resilience of these minute roughnesses. Physical hardness has, in fact, this distinction from chemical hardness that it does not entail brittleness—is diametrically opposed to brittleness. Resilience and toughness are as necessary to increase the life of rails as they are necessary for safety, yet it follows, that for a given toughness, resilience, or elasticity, the greater the hardness the greater will be the wearing capacity. Hardness due to chemical composition is, we say, coupled with brittleness; but it will be admitted that, for any given chemical hardness, the brittleness increases very rapidly as we approach a shape liable to internal strains, and the limit of brittleness being the "danger-line," chemical hardness is more possible as we approach a shape of section not liable to internal strains. As I have already said, the weight on engine-drivers is even now sufficient, with the bearing-surface attained, to "squash" and "flow" the metal in the rail-head of many of our rails. Increased strength to resist these compressive strains is given by greater hardness, physical or chemical; but may we not have reached a point where a greater chemical hardness would be unsafe, yet greater physical hardness impossible, until we have a section which will admit of slower rolling and colder finishing?

VII. *Rails, if anything but straight, should be a little low in the centre and not cambered.* Many rails go into track with a perceptible camber in them, a practice which has grown up, either because the supports on which the rails are inspected are more than 15 ft. apart, or because of a notion of rail inspectors that a rail, like a bridge, should be slightly arched. This, of course, is absurd, and if anything but straight it would seem better that the rail should "sag" slightly in the centre to partly compensate for the lengthening by service of the upper fibres of the beam.

VIII. *Our present knowledge does not justify us in stating the composition of steel which will give the best wearing rail for the least money, but it seems probable that sections permitting colder rolling and less liable to internal strains will safely allow greater latitude of composition, and yet have good wearing qualities.* So many men believe that if we could analyze every rail we should at once know how it would wear and all about it; that to them the consideration of the mechanical conditions of manufacture seems useless. The fact is, that analyses of rail-steel tell very little, and a man could as well judge the value of a piece of granite as a building-stone from knowing the exact amount of silicon in it, as he could judge the quality of a rail from knowing the amount of carbon, phosphorus, silicon, manganese and sulphur in it. Metallurgical chemistry has made and is making great strides; but, as chemists will admit, they cannot yet tell how these elements are combined with the iron, whether they influence the whole "matrix" or whether they are combined wholly among themselves as particles of foreign matter, local in their effect and insignificant. We know more about the effect of carbon than that of any other metalloids which combines with iron in steel, and we know that its condition is greatly affected by sudden or unequal changes of temperature. May it not be so with the other elements? Since we know that phosphorus produces a tendency to coarse crystallization, and that it is probably more potent than carbon in producing internal strains, may we not infer that, if it be important to avoid internal strains and slow cooling from a

high heat with carbon-steel, it is doubly important to avoid it with steel containing notable amounts of phosphorus.¹

The all-important consideration of getting a rail section admitted to colder rolling will not necessitate our going back to the old pear-shaped section, but it probably will require a slight thickening of the web, increasing the slope angles above and below to say 18 degrees, and increasing the fillets connecting the web with the base and head to three-fourths of an inch, limiting the height and width of base, for a rail of 75 lbs. or under, to $4\frac{1}{2}$ in.)

New Track to July 1.

We present herewith a table giving a summary of new track laid in the first half of this year, together with statements of lines under construction. The figures given are from official sources and need no comment, the specific nature of the data shown enabling the reader to intelligently judge of any point of interest.

The totals given below show the approximate mileage in each state; the notable totals being, as has, indeed, been apparent from our news columns, in the Southern states and California.

Alabama	166½	New Hampshire	8
Arkansas	14	New Jersey	3½
California	320½	New Mexico	11½
Colorado	17	New York	21
Dakota	27	North Carolina	84½
Delaware	11	Ohio	16
Florida	38½	Pennsylvania	17½
Georgia	189	South Carolina	119½
Idaho Ter.	24½	Tennessee	158
Illinois	68½	Texas	165
Indiana	5	Vermont	11
Iowa Ter.	82	Virginia	21
Kansas	206	Washington Ter.	70
Kentucky	217½	West Virginia	33
Louisiana	17	Wisconsin	79½
Massachusetts	114½		
Michigan	143	Total, U. S.	2,937
Maryland	6½	Manitoba	8
Minnesota	68½	Ontario	24½
Missouri	181	Quebec	40
Mississippi	8		
Montana	98½	Total, Canada	72½
Nebraska	23		
Nevada	14	Grand total	3,009½

Celebration of Col. Perkins' Birthday.

The birthday of Col. George L. Perkins, the Norwich, (Conn.) centenary, whose portrait was published in the *Railroad Gazette* of last week, has been a topic of universal comment throughout New England and by papers in various parts of the country during the past week. On Sunday (his birthday) Col. Perkins and his wife attended church, where they listened to a sermon specially commemorative of the occasion. At the close of the service Col. Perkins received the congratulations of the preacher and large numbers of the congregation. He spent the rest of the day quietly at home with his family and grandchildren. He was the recipient of a large number of beautiful floral tributes and letters of congratulation and good wishes from all parts of the country. On Monday a reception was given by the Arcanum Club, of which Col. Perkins is an honorary member, and whose club-house was formerly his residence, having been built in 1787, and purchased by him in 1823. About 1,500 people attended the reception, which began at 1 p. m. Col. Perkins remained seated, but shook hands with each guest, and occasionally greeted an acquaintance with a word, although the committee had notified the public to refrain from fatiguing the aged gentleman by hand-shaking. Among the railroad men who paid their respects were the following, most of whom came by special train :

C. P. Clark, President; E. G. Allen, Division Superintendent, and G. B. Baldwin, New York, New Haven & Hartford. Wm. P. Shinn, Vice-President; A. M. Jackson, R. E. Eavensou, C. H. Platt, E. H. Tucker, and L. W. Palmer, Superintendents; A. C. Kendall, J. B. Henney, G. L. Lang, Geo. B. Phippen, R. E. Rockwell, J. W. Perkins, L. B. Bidwell, G. M. Farley and others, New York & New England. T. W. Hammond, Worcester. Wm. H. Cobant, Treasurer, Portland & Rochester, Portland, Me. Edward L. Davis, President; Francis H. Dewey, Josiah H. Clark, Samuel Woodward, Thomas Eaton, directors, and P. S. M. Andrews, Superintendent, Norwich & Worcester. J. W. Marden, Master Car-Builder, Fitchburg road, Boston. James L. Howard, Lieutenant Governor of Connecticut. C. F. Spaulding, Superintendent, New London Northern. S. A. Garduer, Superintendent, Norwich & New York Transportation Co.

Each guest was presented with a fac-simile of Col. Perkins' autograph. After the reception, the Colonel descended to his carriage, while the members of his club gave him three rousing cheers. There was a large crowd upon the streets, while all the windows in sight were full of people. The directors of the Norwich & Worcester road, at a meeting in Worcester on Saturday, adopted a testimonial expressing their appreciation of Col. Perkins' services.

Col. Perkins took part in the defense of Stonington in the war of 1812. He took a keen interest in affairs even in his early days, when newspapers were scarce, and walked from Norwich to Poughkeepsie to see Fulton's first steamboat, taking a ride on her from Poughkeepsie to New York on her return trip. Col. Perkins' office hours are now from 9 to 1, and he walks to and from his business daily. He has no other formula for a long and healthy life than this simple one: The philosophy that takes events calmly, the cultivation and exercise of the sense of humor, the control of the passions and the proper use of the honorable emotions, the enjoyment of any healthy food at regular hours and plenty of sleep.

The Pennsylvania on Export Rates.

We give below an extract from a brief filed with the Interstate Commerce Commission by the Pennsylvania Railroad and its connecting western lines in the matter of through export rates:

The following are respectfully submitted as among the reasons why a through export rate, without subdivision,

NEW CONSTRUCTION, JANUARY 1 TO JULY 1, 1888.

NAME OF ROAD	Track laid between Jan. 1 and July 1, 1888.			Under construction.		
	From	To	Miles	From	To	Miles
Aberdeen, Bismarck & N. W.	Mackey's Ferry, N. C.	Juniper L'd'g.	10	Aberdeen, Dak.	Bismarck	192
Albemarle & Pantego	Bradford, Pa.	Corrydon Summit, Pa.	8	Albany, N. Y.	Albany, N. Y.	2
Allegheny & Kinzua	Attala, Ala.	Cove Creek	11	Albany, N. Y.	Albany, N. Y.	3
Americus, Prest. & Lumpkin	Alexandria	Dukes	6	Albany, N. Y.	Albany, N. Y.	3
Annisson & Cincinnati	Former terminus	Panhandle City	44	Albany, N. Y.	Albany, N. Y.	3
Atlanta, Topeka & Santa Fe— So. Kan. of Tex.	Former terminus	Englewood	5	Albany, N. Y.	Albany, N. Y.	3
So. Kan. of Panhandle	(Frontone Ext'n)	St. Louis	3	Albany, N. Y.	Albany, N. Y.	3
So. Kan.	Athens, Tenn.	Cochran's Store	10	Albany, N. Y.	Albany, N. Y.	3
Atlanta & Florida	Fayetteville, Ga.	Yatesville	46	Albany, N. Y.	Albany, N. Y.	3
Augusta & Chattanooga	Augusta, Ga.	Kiokee Creek	20	Albany, N. Y.	Albany, N. Y.	3
Austin & Northwestern	Big Walnut	Williams	44	Albany, N. Y.	Albany, N. Y.	3
Baltimore & Ohio	Carroll Switch	Clifford, Md.	2	Albany, N. Y.	Albany, N. Y.	3
Bangor & Portland	Matapedia	Carlton, Que.	40	Albany, N. Y.	Albany, N. Y.	3
Barre	Boyles, Ala.	Gale City	7	Albany, N. Y.	Albany, N. Y.	3
Battle Creek & Bay City	Boyles, Ala.	Village Springs	17	Albany, N. Y.	Albany, N. Y.	3
Beaver Creek & Cumberland'd Coal Co.	Scarborough's Mill	Shaws, S. C.	8	Albany, N. Y.	Albany, N. Y.	3
Billings, Clarke's F. & Cooke C.	Salley, S. C.	Seivern, S. C.	13	Albany, N. Y.	Albany, N. Y.	3
Bay of Chaleurs	Blackville	Wagners	24	Albany, N. Y.	Albany, N. Y.	3
Birmingham Mineral	Winthrop, Mass.	(Circuit)	24	Albany, N. Y.	Albany, N. Y.	3
Bishopville	Lyn, Ont.	Westport	18	Albany, N. Y.	Albany, N. Y.	3
Blackville, Alston & Newberry	City Line, N. Y.	Bath, N. Y.	2	Albany, N. Y.	Albany, N. Y.	3
Boston, Winthrop & Shore	Unionville, N. Y.	Coney Island, N. Y.	2	Albany, N. Y.	Albany, N. Y.	3
Brantford, Waterloo & L. Erie	Blakeman, Kan.	St. Francis, Kan.	39	Albany, N. Y.	Albany, N. Y.	3
Brookv. Westp't & Sault Ste. Marie	Lakeside, Nebr.	Alliance, Neb.	23	Albany, N. Y.	Albany, N. Y.	3
Brookfield	Inglewood	Redondo Beach, Cal.	11	Albany, N. Y.	Albany, N. Y.	3
Brooklyn, Bath & West Erd	Perris	San Jacinto, Cal.	194	Albany, N. Y.	Albany, N. Y.	3
Burlington & Mo. Riv.	Ballona Junc.	Orange, Cal.	204	Albany, N. Y.	Albany, N. Y.	3
California Central	San Juan	Los Angeles Junc., Cal.	24	Albany, N. Y.	Albany, N. Y.	3
Cape Fear & Yadkin Val	Pilot Mtn., N. C.	Mo. Airy, N. C.	144	Albany, N. Y.	Albany, N. Y.	3
Madison Br.	Stokedale, N. C.	Madison, N. C.	11	Albany, N. Y.	Albany, N. Y.	3
Wilmington Extension	Fayetteville	Black River, N. C.	30	Albany, N. Y.	Albany, N. Y.	3
Cape Breton	Canso, C. B.	North Sydney, C. B.	150	Albany, N. Y.	Albany, N. Y.	3
Cape Girardeau, S. W.	Chaonia, Mo.	Williamsville, Mo.	15	Albany, N. Y.	Albany, N. Y.	3
Carolina, Cum. Gap & Chic.	Lakeview	Edgefield, S. C.	14	Albany, N. Y.	Albany, N. Y.	3
Carthage & Adirondack	Jayville, N. Y.	Little River	14	Albany, N. Y.	Albany, N. Y.	3
Central of Georgia	Sylacauga, Ala.	Childersburg, Ala.	37	Albany, N. Y.	Albany, N. Y.	3
Columbus & Western	Eden, Ga.	westward	7	Albany, N. Y.	Albany, N. Y.	3
Savannah & Columbia	Clayton	Ozak	40	Albany, N. Y.	Albany, N. Y.	3
Eufala & East Alabama	Barre, Vt.	Williamstown	6	Albany, N. Y.	Albany, N. Y.	3
Central Vermont	near Camden, S. C.	Catawba R., S. C.	36	Albany, N. Y.	Albany, N. Y.	3
Charleston, Cin. & Chic.	Chattanooga, Tenn.	La Fayette, Ga.	25	Albany, N. Y.	Albany, N. Y.	3
Chicago, Bur. & Kau. City	Q. Crossing	Tricon, Ill.	29	Albany, N. Y.	Albany, N. Y.	3
Chicago, Bur. & Quincy	Momence, Ill.	southeast	1	Albany, N. Y.	Albany, N. Y.	3
Chicago Valley & Quincy	Goodland Junc., Ind.	Brook, Ind.	5	Albany, N. Y.	Albany, N. Y.	3
Chicago & Eastern Ill.	E. line, Meade Co., Kan.	S. W. to S. line of Kan.	64	Albany, N. Y.	Albany, N. Y.	3
Chicago & Ind. Coal	E. line, Norton Co., Kan.	Norton City	19	Albany, N. Y.	Albany, N. Y.	3
Chicago, Kansas & Nebr.	Smith Centre, Kan.	near Goodland, Kan.	105	Albany, N. Y.	Albany, N. Y.	3
Chicago, M. & St. Paul	near Kingstown, Kan.	S. W. to State line	84	Albany, N. Y.	Albany, N. Y.	3
Chicago & Northwestern	near Caldwell, Kan.	toward Pond Creek	6	Albany, N. Y.	Albany, N. Y.	3
Chic. St. Louis & Paducah	Lake Geneva, Wis.	Williams Bay	6	Albany, N. Y.	Albany, N. Y.	3
Chic. St. Paul & Kans. City	(in St. Joseph, Mo.)	southward	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Ontario, Cal.	southward	10	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	McComb, O.	Findlay, O.	9	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Carlisle, O.	Franklin, O.	3	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Proctor, Vt.	Centre Rutland, Vt.	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Horatio, Pa.	northward	1	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Warsaw, O.	Dresden Junct., O.	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Marion, Colo.	Aspen, Colo.	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	West Union, S. C.	Walthalla	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Coronado, Cal.	San Diego, Cal.	25	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Monticello, Ga.	beyond Madison, Ga.	35	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Section 30	Grandin, Mo.	30	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Trinidad, Col.	Texas State Line	125	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Branches	8	Albany, N. Y.	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Mullikan, Mich.	Thornapple R.	31	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Oakdale Park	Reed's Lake	24	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Tower, Minn.	Ely	21	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Bad River, Mich.	Aspen, R. Junc., Mich.	4	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Henderson, N. C.	toward Durham	6	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Eoin, Ill.	Spaulding	16	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Joliet	London Heights	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Elgin, Ill.	Hodgensville, Ky.	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Elizabethtown, Ky.	Santee River, S. C.	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Vance's, S. C.	Santee River, S. C.	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Wayco, Fla.	southward	1	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Longwood, Fla.	northward	1	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Fresno, Cal.	Belmont Colony	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Washburn	Belmont Colony	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dallam	Texas line	23	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Geneva, Neb.	Superior	47	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Creighton, Neb.	Verdigris, Neb.	13	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Glen Rock, Wyo.	Fort Casper, Wyo.	25	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Catawba R., S. C.	Chester, S. C.	23	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Columbus, Miss.	Johnsville, Miss.	142	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Doot Co. Line, Ga.	West Point, Miss.	100	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Graf a Centre, Mass.	Chemong Lake	8	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Peterborough, Ont.	San Angelo, Tex.	36	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Bell's Cross Roads	southward	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Ballinger, Texas	Dertzy, Conn.	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	near Hancock	southward	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Botsford, Conn.	southward	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dodgeville, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Madison, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Rockford, Ill.	eastward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Burnside Beach, Fla.	Arlington	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Van Buren, Ark.	Wagner	82	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	In Kansas City	1	Albany, N. Y.	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Easley Sta., Ala.	Bessemer	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Parksville	Coal mines	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Kansas City, Mo.	Harrisonville, Mo.	42	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Seneca, Kan.	toward Holton	7	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Hornellsville, N. Y.	Hornellsville Junc.	10	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Mackinaw R.	Farmdale, Ill.	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Wind Gap	Saylorsburg, Pa.	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dodgeville, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Madison, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Rockford, Ill.	eastward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Burnside Beach, Fla.	Arlington	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Van Buren, Ark.	Wagner	82	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	In Kansas City	1	Albany, N. Y.	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Easley Sta., Ala.	Bessemer	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Parksville	Coal mines	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Kansas City, Mo.	Harrisonville, Mo.	42	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Seneca, Kan.	toward Holton	7	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Hornellsville, N. Y.	Hornellsville Junc.	10	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Mackinaw R.	Farmdale, Ill.	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Wind Gap	Saylorsburg, Pa.	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dodgeville, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Madison, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Rockford, Ill.	eastward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Burnside Beach, Fla.	Arlington	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Van Buren, Ark.	Wagner	82	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	In Kansas City	1	Albany, N. Y.	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Easley Sta., Ala.	Bessemer	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Parksville	Coal mines	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Kansas City, Mo.	Harrisonville, Mo.	42	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Seneca, Kan.	toward Holton	7	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Hornellsville, N. Y.	Hornellsville Junc.	10	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Mackinaw R.	Farmdale, Ill.	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Wind Gap	Saylorsburg, Pa.	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dodgeville, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Madison, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Rockford, Ill.	eastward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Burnside Beach, Fla.	Arlington	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Van Buren, Ark.	Wagner	82	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	In Kansas City	1	Albany, N. Y.	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Easley Sta., Ala.	Bessemer	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Parksville	Coal mines	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Kansas City, Mo.	Harrisonville, Mo.	42	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Seneca, Kan.	toward Holton	7	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Hornellsville, N. Y.	Hornellsville Junc.	10	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Mackinaw R.	Farmdale, Ill.	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Wind Gap	Saylorsburg, Pa.	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dodgeville, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Madison, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Rockford, Ill.	eastward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Burnside Beach, Fla.	Arlington	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Van Buren, Ark.	Wagner	82	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	In Kansas City	1	Albany, N. Y.	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Easley Sta., Ala.	Bessemer	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Parksville	Coal mines	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Kansas City, Mo.	Harrisonville, Mo.	42	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Seneca, Kan.	toward Holton	7	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Hornellsville, N. Y.	Hornellsville Junc.	10	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Mackinaw R.	Farmdale, Ill.	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Wind Gap	Saylorsburg, Pa.	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dodgeville, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Madison, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Rockford, Ill.	eastward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Burnside Beach, Fla.	Arlington	14	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Van Buren, Ark.	Wagner	82	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	In Kansas City	1	Albany, N. Y.	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Easley Sta., Ala.	Bessemer	11	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Parksville	Coal mines	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Kansas City, Mo.	Harrisonville, Mo.	42	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Seneca, Kan.	toward Holton	7	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Hornellsville, N. Y.	Hornellsville Junc.	10	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Mackinaw R.	Farmdale, Ill.	15	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Wind Gap	Saylorsburg, Pa.	5	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Dodgeville, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Madison, Wis.	southward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Rockford, Ill.	eastward	2	Albany, N. Y.	Albany, N. Y.	3
Cin. Ham. & Dayton	Burnside Beach, Fla.	Arlington	14	Albany, N. Y.	Albany, N. Y.	3

NEW CONSTRUCTION, JANUARY 1 TO JULY 1, 1888—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and July 1, 1888.			Under construction.		
	From	To	Miles	From	To	Miles
Lime Rock				Lime Rock Quarries,		
Long Island				Locust Valley, N. Y.		
Los Angeles County	Los Angeles, Cal.	Burbank, Cal.	10	Los Angeles, Cal.	San Pedro, Cal.	24
Los Angeles & Ocean	Los Angeles, Cal.	Prospect Park	2 1/2	Los Angeles, Cal.	San Pedro, Cal.	24
Louisiana No. & So.	Homer, La.	southward	6	Pineville, Ky.	Curr. Gap Tunnel	14
Louisville & Nashville	Barboursville, Ky.	Pineville, Ky.	16	West Point, Ky.	Henderson, Ky.	139
Louisville, St. Louis & Texas	Owensboro, Ky.	Cloverport, Ky.	38	Harrodsburg	Harrodsburg	9
Louisville Southern	Louisville, Ky.	Harrodsburg	77	Midway	Georgetown	10
Lynchburg & Durham				Lyndhurst, Va.	South Boston, Va.	60
Macon & Dublin				Durham, N. C.	northward	10
Manistee & N. E.				Macon, Ga.	Dublin, Ga.	55
Manitoba Central	U. S. line	northward	8	Manistee, Mich.	northward	30
Manitoba & Northwestern				Main line	Okeana	3
Marietta, Col. & Nor.	Big Run, O.	Stewart, O.	5	Chicago	Winnipeg Man.	63
Michigan Central	In Detroit		4	Winnipeg Man.	Stirling, N. W. T.	20
Midland of Indiana	Rhineland, Wis.	northward	17	Ladago, Ind.	Brown's Valley	10
Minw., L. S. & Western				Rhineland, Wis.	Fiambeau	10 1/2
Minnesota & Dakota				Fargo, Dak.	Otate, Dak.	10 1/2
Min., St. P. & Sioux Ste. M.	Cardigan, June	Soo Line June	5 1/2			
Miss. Riv. & N. W.	Arkansas City, Ark.	Saginaw, Ark.	6			
Missouri, Kan. & Texas				Dallas, Tex.	Hillboro, Tex.	66
Missouri Pacific	Lexington, Mo.	Boonville, Mo.	77	Lockhart, Tex.	Smithville, Tex.	36
Mobile & Birmingham	Spratey, Ala.	Atkieson, Ala.	24	Boggy Tank, Tex.	Sealy, Tex.	27
Montana Central	Great Falls	Land Coute	16			
	Silver	Fairground	6			
	Helena	Butte	6			
Monroe & New Orleans				Rob Roy	toward Raineyville	10
Napanee, Tamworth & Quebec				Tamworth	beyond Maribank	10
Narragansett Pier				Naragansett P. R. I.	South Ferry	4 1/2
Nashv., Florence & Sheffield	Iron City, Tenn.	Florence, Ala.	20			
Nashville & Knoxville	Lebanon, Tenn.	Gordonsville, Tenn.	32			
Natchitoches	Frudhomme Sta.	Natchitoches, La.	11			
Nevada & California	Doyle, Nev.	southward	14			
New Castle & Shenan. Val.				New Castle, Pa.	W. Middlesex, Pa.	19
New York & Northern	Van Cortlandt	Yonkers	3			
Norfolk & Western	on Flat Top Exten.		2			
	on Clippel Ck Exten.		2			
	on Clinch Val. Div.		12			
Northern Pacific	near Corvallis, Mont.	Grantsdale	10 1/2			
	Colton, W. Ter.	Genesee, I. Ter.	14	Green R. Sta., W. T.	P. Kirk's coal mine	3
Oregon Ry. & Nav. Co.	Wallula, W. T.	Centerville, Or.	34	Phelpsburg, Mont.	Mine	7
		Eureka Flat, W. T.	18	Branches and Exten.		71
Orlando & Winter Park	Orlando, Fla.	towards Winter Pk.	2			
Oxford & Clarksville	Clarksville, Va.	Oxford, N. C.	25			
Palmdale	Seven Palms Sta., Cal.	Palmdale, Cal.	6 1/2			
Paragould & Buff. Island				Paragould, Ark.	toward St. Francis R.	5
Penn., Pough. & Boston				Po'keepsie Bridge	Montgomery, N. Y.	25
Pensacola & Memphis				Pensacola, Fla.	northward	65
Peoria Terminal				Peoria, Ill.		3
Phila., Wilm. & Balt.	Shellpot Br. (Wilm.)	New Castle, Del.	5			
Pitts., Shenango & L. Erie	Wilmington, Del.	Amasa, Pa.	3 1/2			
Pomona & Elsinore				Amasa, Pa.	Conneaut, O.	50
Pontiac Pacific Junction				Amasa, Cal.	Temescal Cañon	29
Portland & Vancouver				Elsinore		14
Powells Valley				Black River, Ont.	Pembroke, Ont.	8
Raritan River				E. Portland, Or.	Vancouver, W. T.	8
Richmond & Danv.	Jarrets, N. C.	R. M. Gap	3	Knoxville, Tenn.	Cumbr'd Gap, Tenn.	63
Ripley & Mill Cr. Val.				South Amboy, N. J.	N. Brunswick, N. J.	12
Roads & Southern				Red M. Gap	Murphy, N. C.	27
Roads & Tar River				Weston	Wicksboro, N. C.	13
Rochester & Glen Haven	Rochester, N. Y.	Glen Haven	3 1/2	Midway	Jackson, C. H.	13
Rockaway Valley				Sal'm & Winston, N. C.	Marlinsville, Va.	60
Rome & Decatur				Beverly Sta., N. C.	Lewiston, N. C.	3 1/2
St. Augustine & So. Beach	Near Rome, Ga.	westward	20	White House, N. J.	New Germantown	4
St. Catharines & Niagara Cent.	Thorold, Ont.	St. Catharines	5	Junction	South Beach, Fla.	12
St. Cloud & Sugar Bel.				Kissimmee, Fla.	Runnymede	12
St. John & Halifax	E. Pelitka, Fla.	Railston	3 1/2	Alton, Ill.	Newbern Ill.	13
St. Louis, Alton & Springfield	In Alton, Ill.	Railston	1	Parker City	Brooklyn, Ill.	40
St. Louis & Fair Short Line				Springfield, Ill.	Eureka, Ill.	75
Chic., St. Louis & Paducah				Battle Creek, Mich.	Athens, Mich.	15
St. Louis & Carcago						
St. Louis, Sturgis & Battle Creek						
St. Paul & Duluth						
	Thomson, Minn.	West Duluth, Minn.	13 1/2			
	West Duluth, Minn.	West Superior, Minn.	39			
	Willmar, Minn.	southward	22			
	Watertown, Dak.	southward	22			
	Great Falls, Dak.	Smeiter Works	5			
	On Waco branch		56			
	Skiomore, Tex.	Kleburg	43			
	Gregory, Tex.	Rockport	20			
San Antonio & A. P.				Napa, Cal.	Clear Creek, Cal.	67
San Fran., Clear Lake & Humb.						
San Francisco & North P.						
Marin & Napa						
San Gabriel Val. R. T.	Izacio, Cal.	Seares Point	7 1/2			
Santa Anna, Fairview & Pac.	Monrovia, Cal.	westward	10	Los Angeles, Cal.	eastward	6
Sault Ste Marie & Western	Santa Ana	Fairview, Cal.	8			
Seattle, Lake Shore & East	Woodville, W. T.	Gilman	20	Rhineland, Wis.	Miss. River	175
Selma & Cahaba Valley	Snohomish June	northward	14	St. Catherine Falls	Sunmit Cascade	40
Shelf Id & Birmingham	D. Imar, Ala.	Jasper	36	Gilman	Bessemer	97
Ship Island, Ripley & Ky.	Che Ry Creek	Pontotoc, Miss.	8	Selma, Ala.		
Silverton	Silverton, Col.	Chattanooga	2			
Silver Springs, Ocala & Gulf	S. Dunnehan, Fla.	Junction	1 1/2	Chattanooga	Ironton	10
South Florida				Dunnehan	Bridgers	17 1/2
Southern Pacific	Tampa, Fla.	Port Tampa	19	Homassassa		22
Santa Rosa & Carquinez	Shingle Springs, Cal.	Placerville, Cal.	12			
Stockton & Tulare	Napa June, Cal.	toward Santa Rosa	33 1/2			
Woodland C. & C. L.	Fresno, Cal.	toward Poso	67			
Staten Island R. T.	Madison, Cal.	Rumsey	24			
Suburban Rapid Transit	Clifton	Richmond Ave.	1 1/2			
Suffolk & Carolina						
Suwanee Riv. T.	Ryland, N. C.	Montrose Landing	4			
Syracuse, Geneva & Cuning	On Hudson branch					
Tennessee & Coosa						
Tenn. see Midland	Memphis, Tenn.	Jackson, Tenn.	85 1/2			
Texas & Pacific	Strawn, Tex.	Palo Pinto Mines	4			
Thomsonville, T. & M.	Thomasville, Ga.	southward	8			
Toledo, Saginaw & Mack	East Saginaw, Mich.	Flint River	11			
Troy & Tiptonville	Duraud, Mich.	Troy, Tenn.	5			
Tuscaloosa & Northern	Rives, Tenn.					
Union (Chattanooga)						
Union Pacific	St. Elmo	Mt. Junct.	1			
Lincoln & Col.	Near Waldo, Kan.	Westward	4			
Upper Coos						
Valley Ohio						
Van-over, Klickitat & Yakima						
Versailles & Midway						
Vincennes, Oakland C. & Owensb.						
Wald n's Ridge	Vincennes	Owensboro, Ky.	70 1/2			
Warrior Coal Fields	Clinton, Tenn.	Oliver Springs	15			
West-Id of Florida						
West-Rd & Mendocino	Belmore, Fla.	Westward	1 1/2			
West Virginia Central	Willows, Cal.	Westward	5			
Wheeling & Lake Erie	Thomson, W. Va.	Tub Run	20			
Williamsstown & Del. R.						
Wilmington Sea Coast	Glassboro, N. J.	Five Points	3 1/2			
Wilmington & Weldon	Wilmington, N. C.	The Beach	9 1/2			
	Scottland Neck, N. C.	southward	5			
	Pee Dee, S. C.	Little Rock, S. C.	18			
Wisconsin Central						
Zanesville & Ohio River	Waterford, O.	Lowell, O.	12			
Zealand Valley	Zealand, N. H.	Zealand Notch	8			
Totals			3009 1/2			5563
* Work suspended.						

ought not only to be permitted but encouraged by the Commission:

(a.) The action of the Canada lines, prevailing for years previous to the passage of Inter-state law, in making through rates to Europe from points in the interior of the United States, via the ports of Boston, Portland, Montreal and Quebec, which were, as we understand it, treated independently of their domestic rates from western points to these seaboard ports, and divided with ocean carriers upon a percentage basis.

(b.) The fact that the city of Boston was the only eastern port having the advantage of two rates upon lines traversing a portion of the United States, one domestic the other export.

(c.) That the export traffic, whilst being a very small proportion of the whole to be moved by the lines running through the territory of the West and South, involves the movement of the surplus production of grain, provisions, oil, cake, tobacco, cotton and flour—the six articles that cover about all the export trade.

(d.) The fact that under the principle now prevailing, and which has prevailed except during a short period between November, 1877, and February, 1888, the ports of Philadelphia and Baltimore are placed at a disadvantage in the fact that they do not enjoy as much and as spirited ocean competition as the city of New York.

(e.) The desire to create continuous lines from points in the United States to points in Europe, partly by rail and partly by water, which would place the whole rate, ocean as well as rail, under the jurisdiction of the Commission, and would guarantee to a shipper in the West or South the advantages of such continuous lines, without subjecting his property to assessment or delay of any kind en route.

(f.) The belief that it would be impossible for the Commission to legislate upon the inland proportion of such through rates, for the reason that the ocean charges from all ports fluctuate so suddenly and so widely, owing to the abundance or scarcity of unoccupied ships at the various ports at the same time, thus causing the inland proportions of the through rates to suddenly and violently fluctuate also.

(g.) The belief that the failure of the rail transportation companies between the West, South and East to make a different rate per mile upon export business than that made upon domestic business would result either in an absolute loss of the surplus production or the shipment of it by other routes; it being understood, of course, that this surplus has to meet the competition of the world in foreign ports.

(h.) The present rate on grain from Chicago to New York is twenty-five cents per one hundred pounds, five dollars per ton for one thousand miles, or about five mills per ton per mile. It is urged that the Commission should first decide as to whether that rate is in itself fair and reasonable in consideration of the service performed. If, in its judgment, it is fair and equitable, then the surplus production of the Western and Southern states should be allowed to seek the markets of the world, always providing that the aggregate charge for the long haul should not be less than the charge for the short over any portion of the same route in the same direction.

For these and other reasons that might be cited it is submitted that the Commission should decide this case, as between a city or town in the interior of the United States and Europe, as it has recently decided the case of the Omaha Board of Trade against the Chicago, Burlington & Quincy Railroad Co. and other companies.

It is the absolute conviction of this petitioner that the railroad carriers of the country amenable to the Commission must either be permitted to carry this surplus abroad at considerably lower rates per ton per mile than prevails upon domestic business, or go out of the export trade altogether, and let the surplus production seeking foreign markets either be moved by routes not amenable to your Commission or the property be disposed of at the place of production at an unnecessary sacrifice.

So far as the city of New York is concerned it is impossible to see how it would work any serious injury to the exporter from that port, who has at all times more unoccupied ocean vessels and the advantage of sharper competition in ocean freights than any other port in the United States, thus enabling him to pay a higher inland rate to this city than a shipper in Philadelphia, Baltimore or any Southern Atlantic port can do.

German Switch Movement and Facing Point Locks.

BY E. A. GIESELER, C. E.

The following is a translation, considerably abridged, of a lecture by Superintendent Kollé before the Berlin Railroad Club last February, and published in Glaser's *Annalen*. Some of the facts given are not by any means new to the readers of the *Railroad Gazette*, but others are, and it is thought that even the more historical portion will not be without interest.

The speaker discussed the arrangements by which a close contact between the point of the switch rail and the stock rail is effected in split switches, more especially in those which are worked from a distance.

On the early English railroads, switches consisted simply of two pointed rails, each one yard long, which were secured at one end by a bolt around which they turned. There were no switch rods, and the switches were worked somewhat on the style of our present horse-car switches. The opening for a train moving against the point, was done by the fireman, who had to leave the engine for this purpose, and after having set the switch had to stand by it during the slow passage of the train. Whenever the switch rail left the position of close contact with the stock rail, which would frequently occur between the passage of two wheels, it was pulled back again by the fireman with an iron hook, an operation requiring much steadiness of hand and eye. The man who first connected the two switch rails by rods and then employed a lever for the simultaneous working of both, undoubtedly made an important invention.

When the switch is worked from a stand located at the point the close fit of the point of the switch rail may always be insured by observation by the attendant, and changes in the length of the switch rod and play of the pins caused by wear are often corrected automatically by the stroke of a weighted lever. This device was retained in the early English signal and safety switch arrangements. These consisted in hardly anything more than the assembling in one place of several switch stands.

In Germany the first interlocking machines were constructed in 1868 and 1869 after English patterns (Saxby & Farmer system), but they did not give much satisfaction. From 1871, however, the construction of interlocking devices took a fresh start in Germany and in a few years the English models were not only equalled, but in some cases left behind by the German machines.

The use of interlocking apparatus requires operating switches from distances say up to 300 or 400 yards. Under these circumstances the operator evidently cannot convince himself by ocular inspection of the close fit of the switch point against the stock rail, and the question therefore arises how he can be held responsible for something which he

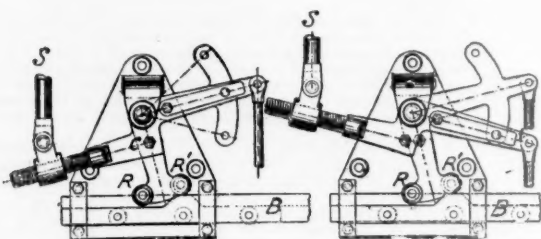


Fig. 1.

Fig. 2.

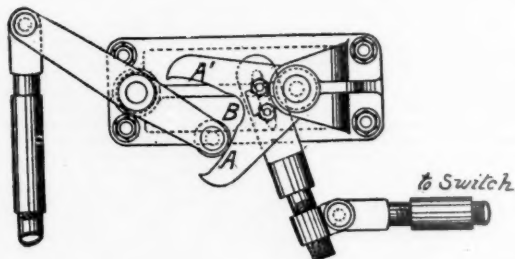


Fig. 3.

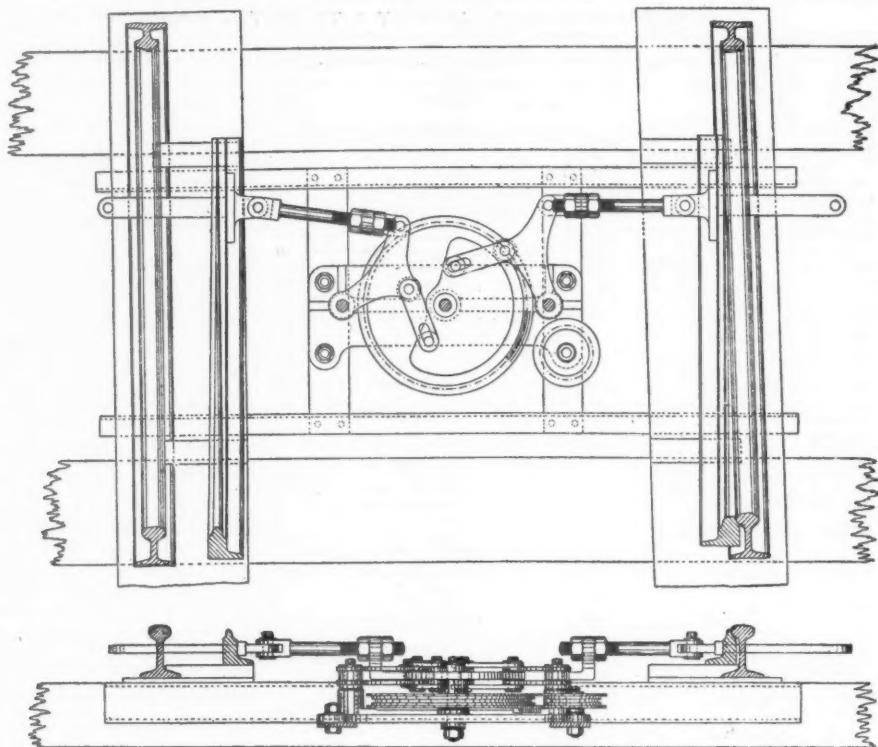


Fig. 4.

cannot see? To remove this difficulty the requirement must be made of every interlocking apparatus being constructed so as to positively guarantee the close fit of the point when the lever belonging to it has been pulled over. Ordinarily the interlocking apparatus contains one lever for each signal or for each switch. It is possible, however, to operate two switches by means of only one lever; but it is not advisable to connect more than two switches with one lever, as the difficulty of operating it is thus increased while the certainty of the close fit of the point is diminished.

When switches are operated by a double wire connection, the restriction of the stroke and holding the lever in its end positions guards against excessive tension being brought on the wires, and prevents the reversing of the switch by unauthorized persons. The length of stroke of the lever for a double wire connection is made, in German practice, about 20 in.; when the switch is worked by a rod it is not made more than 10 in. The proportion between the two arms of the lever is from 1:4 to 1:5. These proportions are employed in the apparatus as constructed to-day, and have been determined on the basis of long experience. In the older English and German arrangements the connections consisted exclusively of rods. These started from the lever, and at the other end operated a bell crank. Levers with unequal arms, in order to obtain an increase or a decrease of motion, were avoided as much as possible. The stroke of the lever was little more than the throw of the switch. If the latter is put at 5 in., then the stroke was about 6½ in., having an excess of 3¾ in. on each side, in order to take up slack arising from imperfect workmanship and from wear. The point of the switch rail can thus still be brought into close contact, as long as the wear of the connections does not exceed certain limits; but the very means by which this result is obtained, the excess of stroke, causes an abnormal straining of the connections and a gradual increase of imperfections. What is gained on one side is therefore lost on the other. If an apparatus of this kind is not constantly kept in careful repair, close contact cannot be expected.

Notwithstanding this great disadvantage this system has been and still is in extensive use. In England it has been improved by the addition of the ordinary facing point, which the lecturer here described. Each switch in this system requires two levers, one to set the switch itself and the other one to lock the points. Hence the great number of levers in English interlocking machines. These locking arrangements were generally connected with "locking bars," by which a train moving against the point prevents an inadvertent reversing of the switch during the passage of the train through it.

END COMPENSATION.

In these systems the two ends of the connection at the lever and at the switch are fixed points, and in order to allow for changes of temperature compensating devices are introduced. In characteristic distinction to this the modern system leaves the switch end of the connection free. This end will, therefore, move under the influence of the variations of temperature and arrangements must be made to secure complete reversing of the switch notwithstanding the shifting of the working point of the reversing force. To attain this object it seems natural to locate the compensating device at the switch end of the connection and to connect it with the reversing apparatus in such a way that the latter is not affected by expansion and contraction. Arrangements of this kind, which are the ones in general use to-day, are known as "end compensations with facing point lock."

By the old system compensation is generally effected by means of levers, either straight ones with equally long arms or bell cranks, which are introduced in the connection, the underlying principle being that the expansion or contraction acts on the two ends of the compensating lever in opposite directions and, therefore, simply results in turning the same, without at the same time causing any alteration in the length of the connection.

In long connections there must always be several compensating levers, thus undesirably increasing the number of weak points. For these reasons locating the compensating device at the end of the connection must be pronounced a decided advance, although it must be added at the same time that it has not entirely abolished the old system. In connections longer than 500 ft. it is advisable to have intermediate compensation besides end compensation.

Switch connections with fixed ends and restricted stroke of lever will work reliably only so long as the movable parts fit well; that is, so long as there has been no appreciable wear. But as soon as this commences to make itself felt, then the exact working of the apparatus will cease, and with it

the certainty of a complete contact between point and stock rail. Herein lies the great disadvantage of this system as compared with the ordinary tumble switch, where the unrestricted stroke of the lever compensates all such defects. With the introduction of end compensation the same advantage is also secured for long connections.

The end compensating arrangement is connected with the apparatus for reversing the switch, the fundamental idea being to introduce between switch-rod and the connection a member, connecting these two in such a way that only so much of the movement of the connection is transmitted to the switch-rod, as is required for the throw of the switch. That part of the movement, which is not transmitted to the switch, is utilized to compensate for the alterations in length, the permanent ones resulting from wear, as well as the temporary ones resulting from changes of temperature. It may therefore, be said that the stroke required for reversing the switch must be equal to the sum of the following three items:

1. A value depending on the throw of the switch.
 2. The greatest possible difference in length caused by changes of temperature.
 3. The increase in length caused by usage.
- The first item is about 5½ in., the third one about 1½ in. for the greatest practicable length of connections. The entire length of stroke is usually made about 10 in., which leaves available for the second item an amount of about 3 in., sufficient for a length of connection of, say, 400 ft. If a greater length is constructed then intermediate compensations have to be inserted.

We now come to the description of the connection between the end compensating device and the member securing the close contact of the point to the stock rail.

SPECIAL GERMAN DEVICES.

Locking switch movements may be divided into two large groups, the first group consisting of those by means of which both switch points are moved simultaneously, the second group consisting of those by means of which one switch point

is shifted after the other. All earlier point locks belong to the first group. The second method of construction has only recently been introduced, but seems to be destined to supersede the first one. Its advantage consists in the fact that the amount of force required for the reversing of the switch is distributed more uniformly over the entire length of the stroke. Gast's point lock, figs. 1 and 2, was patented in Germany in 1879. To one arm of the crank the switch-rod S is attached, while the other arm bears two steel rollers R and R', the first one located on the upper side of the arm, the other one on the lower side.

The bar B is attached to the connection from the lever and moved by it. It is grooved on each side as indicated by the full and the dotted lines. The wedge-like action of the moving bar on either one or the other roller and the resulting movement of the switch-bar are easily understood from the drawing.

In order to prevent damage to the apparatus in case the switch is forced, the bolt C is introduced, which connects the upper and lower parts of one arm of the crank. This bolt is strong enough to resist the pressure brought on it during the working of the switch, but it will break when the switch is forcibly opened, and by so doing it will prevent injury to other parts. These "shearing bolts" must be carefully adjusted, and their diameter and distance from the fulcrum are arranged so that shearing takes place at a strain of 8,000 or 10,000 lbs.

In order to prevent any accidents arising from a wrong signal being given after a switch has been forced, an attachment has been added to the crank, which holds the switch in its forced position and thus prevents any movement of the lever, and consequently the setting of the safety signal for the main track. The immovability of the lever at the same time is an unmistakable sign for the switchman that the switch is out of order. An attachment of this kind is shown in the foregoing cut, in which fig. 1 represents the switch in its normal position, while fig. 2 shows it after having been forced

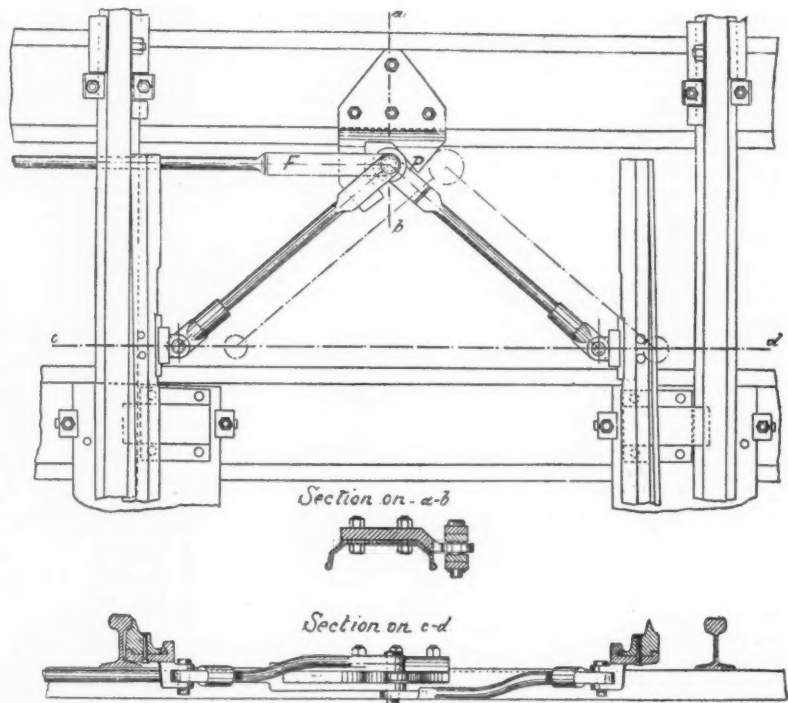


Fig. 5.

GERMAN FACING POINT SWITCH MOVEMENTS.

The attachment consists in a third arm to the crank, the lower part of which carries an arc with two holes at the extreme ends. To the upper part is fitted a spring carrying a bolt that fits into the holes, and will enter either one of them when through the forcing of the switch and the breaking of the shearing bolt consequent thereon the apparatus takes a position as shown in fig. 2.

Fig. 3 shows one of the most common facing-point locks combined with end compensation. It was invented by Buessing and patented in 1879.

The lower connection is attached to the longer arm of a straight lever swinging around a fixed fulcrum, while the switch rod connects by means of an adjustable arm with a bell crank, which is moved by the shorter arm of the straight lever. When the lower lever is pulled, the rocking lever commences to swing and the steel roller, which it carries at the end of the short arm, travels along the arc A; that is, it first makes the movement required for compensating purposes. When the roller has traversed the arc A and arrived at the apex B the reversing of the switch commences. The crank is turned and complete contact of the point effected by the roller now pressing against the other arc A'. During the first part of this movement, that is, while the roller passes along the arcs A and A', the amount of force required is exceedingly small. As soon, however, as the roller enters the apex B the force required suddenly rises to its maximum, thence gradually diminishing. We therefore perceive that this construction shares with the previously described ones the disadvantage of a very uneven distribution of the amount of force required. Provision is made against the "forcing" of the switch in a similar way as described before by means of a shearing bolt.

The second group of facing point locks, as stated before, consists of those by means of which one point is moved after the other one. In this group there are two switch rods, one leading to each point. An example of these locks is given in fig. 4.

The action of this device in moving the switch consists of three distinct parts. During the first third of the entire stroke the point in contact remains motionless, while the movement of the other point toward the stock rail commences. During the second third the withdrawal from contact of the first point begins, while the second point reaches the end of its journey; that is, the position of contact. During the last third the movement of the first point is completed; that is, the "throw" of the switch is fully opened, and further, a pressure is exercised on the second point, securing complete contact with the stock rail.

It is quite clear that here the required force is distributed much more uniformly over the stroke than it was in the devices of the first group. In addition to this there is the further advantage that in an arrangement of this kind no special provision is required against the forcing of the switch, as this cannot result in damage to any part, but will simply communicate motion to the lever connection and give the man at the interlocking machine warning of the occurrence.

A movement belonging to this group and of exceedingly simple and effective construction was invented by Mr. Mackensen, of Bromberg, and is shown in fig. 5 in plan and sections.

Here two jointed bars meet at about a right angle, on the apex of which the switch rod acts. The locking is effected by a member bolted to the tie, and projecting beyond it as shown. The sides of the projecting part of this member form the bearing surfaces, against which the joint of the switch rod and bars presses by means of a roller turning on the joint bolt. In order to insure steady motions of the roller the end F of the switch rod is fork-shaped, and encloses between its two parts one of the projecting ends of the bearing surface. The working of the apparatus is as follows: During the first quarter of the stroke the roller travels to the apex P of the bearing surface, and at the same time has closed the now open point, while the point in contact remains motionless, the bar acting on it simply turning around its joint as a fulcrum. Then the roller will turn the apex P and move both points to the amount of half the throw, so that when three-quarters of the stroke has been made the open point has been brought to contact, while the other point has completed one half of its journey. This will be finished entirely during the last quarter when the roller travels behind the apex P, and at the same time securely locks the point now in contact. In case there is an obstacle preventing complete contact, the roller cannot possibly travel behind the apex P, and consequently the switchman will find it impossible to complete the stroke of his lever, which is a warning of something being out of order.

This movement is an example of those without end compensation. If the connection is long, intermediate compensating levers must, therefore, be inserted. No special provision is required against forcing the switch, as it cannot damage any part of the apparatus. Experiments made in this respect have given very favorable results for this device. Another great advantage of it consists in the fact that complete contact is obtained when the lever has only completed about two-thirds of the stroke. If a foreign body has entered between point and stock rail, then this cannot fail to be noticed from the impossibility of going beyond the second third of the lever stroke. It should be added that this switch can also be worked by hand by means of an ordinary switch stand.

In the foregoing some of the more frequent forms of German facing point locks have been described. There are numerous others equally good, which have been ignored here, the intention having been not to cover the entire ground, but only to describe some characteristic forms.

The Brotherhood of Engineers.

At Minneapolis, on Aug. 5, a meeting was held which is reported to have been composed, like that at St. Joseph, Mo., a fortnight ago, of representatives of the Brotherhood of Locomotive Engineers, the Brotherhoods of Firemen and Brakemen and the Switchmen's Mutual Aid Association. The doings of the meeting are not reported, but it seems to have been participated in by the more radical factions of the various organizations named, with the object of forming an amalgamation of all the associations. It is said that the sentiment of the meeting was unanimous in favor of this.

The Nebraska State Board of Transportation has considered the subject of the Burlington strike and made a report, severely condemning the action of the Burlington engineers and stating that they are liable for conspiracy and for damages sustained thereby. The report further states that the engineers and firemen now on the Burlington road are as competent as those who struck.

A Chicago dispatch of Aug. 4 states that a number of striking engineers have been re-employed by the Burlington road within the last fortnight.

A convention has been called to meet at St. Louis, Aug. 9, at which only the chief officers of the Brotherhood of Locomotive Engineers, together with the chairmen of grievance committees from various parts of the country will be present, ordinary members not being admitted. It is said that the meeting is called for the purpose of deciding upon the course to be pursued by the order with reference to the Burlington strike. The officers will here doubtless formulate a scheme to

be presented to the general meeting which has been announced to be held at Detroit, Aug. 17, in commemoration of the twenty-fifth anniversary of the formation of the brotherhood.

TECHNICAL.

A Tunnel Through the Pyrenees.

According to the *Gaceta de los Caminos de Hierro*, of Madrid, the project of piercing the Pyrenees is at last assuming definite shape. The proposed new route will be a continuation of the present Huesca line of the Northern Railway of Spain towards the French frontier, through the Somport Pass and then onward toward Oloron, on the Midi system of France. This will involve 86 miles of new line in Spain, and 31 miles in France. The tunnel through the Somport will be about 4½ miles long, and at the southern end will be 4,278 ft., and at the northern end 3,552 ft., above the level of the sea. Work on the first section—between Huesca and Turunana—is expected to begin by the end of September or the beginning of October; and the Northern Company are to push forward the line to their proposed termination at Jaca as fast as their finances will permit.

Proposed Railroad through Asia Minor.

Consul Jewell, who is stationed at Sivas, Asiatic Turkey, contributes an interesting note to the consular reports on a projected railroad from Constantinople to Bagdad. The road is to start from Ismid, the terminus of a short line from Scutari. It is projected to pass through Angora, Yussat, Sivas and Kharpoet, where it crosses the Euphrates. Thence it will go to Diar Bekr, which is the head of raft navigation on the Tigris, and will follow that river through Mosul to Bagdad, from which point there is easy navigation to the Persian Gulf. Mr. Jewell enumerates over one and three-quarter million inhabitants in some of the towns and districts traversed by the proposed road, with ores of iron, copper and argentiferous lead, coal, rock salt, marble, asbestos and heavy forests, west of the Euphrates, southeast of which are bitumen, petroleum and grain in great quantities in the valley of the Tigris. The lighter products are hides, mobair, wool, yellow berries, gums, silk cocoons, rugs, carpets and vegetable dyes. The estimated length of the road is 1,400 miles, and the cost £15,500,000, or about \$53,600 per mile. This is probably the road the Sultan is said to have interviewed both Mr. Gould and Mr. Vanderbilt about when they were at Constantinople; but it seems a line the English and the Russians have the most interest in, as it would shorten the time to India by 9 or 10 days and give a route independent of the Suez Canal. It would not shorten the time as much as a route down the Euphrates, but unless Russia met it promptly by connecting it with her system it would render the acquisition of Asia Minor by that power difficult if not impossible without a previous control of the Scutari end.

The great activity of railroad building in this country may very possibly be approached in Asia by the building of lines required by strategic rather than commercial considerations; though, as in the case of the trans-Caspian road, when the industrial revolution was probably greater than in the case of any American line, the industrial results will follow with speed.

The Russians, who are said to have built 900 miles or more from the Caspian to Samarcand for 40,000,000 roubles, or about \$33,000 per mile, and who have shown themselves nearly if not quite our equals in rapid and economical railroad construction under difficulties, are said to be hurrying up their central Asian surveys, and England will very likely find it necessary to push a road north through Burmah to secure her trade with China, even if she does not build northward toward Herat to protect her Indian frontier. In the meantime Russia should not allow Persia to waste money by commencing construction at Teheran.

An Automatic Switch.

A company is being formed to manufacture and introduce Springstein's automatic switch. The names of the officers are given as follows: W. K. Muir, Detroit, President; Mr. McNally, of Rand, McNally & Co., Vice President; John N. Abbott and W. H. Hulbert, directors. The switch-rod in this switch extends for about 4 ft. to one side of the track, as in an ordinary switch, but at that point, instead of connecting with an upright lever, it is attached by means of bell cranks to horizontal rods extending parallel to the track about 30 ft. in each direction. The extreme ends of these rods are attached to track instruments, which are placed close to and outside of the rail. When the switch is set for the side track this track instrument is in a position about 2 in. higher than the rail, and the passage of a train or of a pair of wheels depresses it and thereby turns the switch, setting it right for the main track. The track instrument on that side of the switch which must be passed over in running on to the side track is held in place laterally by a spring, and when a train is to go on to the side track this spring must be held back by the attendant, so that the wheels will not touch the track instrument. The track instrument at the other side of the switch is permanently fixed, as all trains approaching from that direction must have the switch set for the main track. The switch rails are held in position only by the connections here described, and the hand lever attached to the extreme end of one of them is used for moving the switch in ordinary practice. This switch has been tried on the Chicago & Grand Trunk and is looked upon favorably by a number of superintendents who have seen it.

Electric Train Lighting by Primary Batteries.

A test of the Egan primary battery and its application to the lighting of passenger coaches was made recently in Columbus, O., on the Columbus, Hocking Valley & Toledo. A coach with the battery suspended underneath was attached to a train, and a trip made to Logan and return. During the entire trip a satisfactory light was given. For a time four 20 candle-power incandescent lamps were used, illuminating all parts of the coach. Later, two 30-candle lamps were substituted. Probably the most pleasing experiment was with a single 50-candle lamp. This illuminated the car more satisfactorily than any two ordinary coal oil lamps. A company to manufacture the plant is being formed in Columbus.

New Interlocking.

The Pennsylvania Railroad is to put in an interlocking system at the Camden and Burlington County Junction in Camden, N. J., and also one at the junction of the Camden & Atlantic road, in the same city.

The Cumberland Gap Tunnel.

This tunnel is being built by the Knoxville, Cumberland Gap & Louisville Railroad. It is for single track, 14 ft. wide in the clear, and 21 ft. from base of rail to face of arch. The total length will be 3,750 ft. The material on the north side is sandstone, with an occasional stratum of coal. On the south side it is black shale. Timbering is necessary on both sides. The usual "American" block-timbering is used.

Work has just fairly begun. An Ingersoll plant is in place at each end. The last week in July the heading was advanced 36 ft. at each end, 72 ft. in all. The workmen were mostly green, and there were various delays natural on a new work. The contractors are Mason, Hoge & Co., Cumberland Gap, Tenn.

Oil Fuel for Blacksmith's Fires.

Oil is now used for fuel in place of coal in some of the fires in the Boston & Albany blacksmith shop, at Springfield.

Chilian Locomotives.

Messrs. Lever, Murphy & Co., who have works employing about 450 hands, at Caleta Arbacá, about four miles from Valparaiso, Chili, are constructing six locomotives for the state railways of Chili.

The locomotives are entirely constructed there with the exception of the wheels, which are of English manufacture. The contract price is about \$21,000 gold each. The general design is American and the cylinders are 17 x 54.

The Sheffield Ship Canal.

In consequence of the migration of heavy trades from Sheffield that city, like Birmingham, is moving for a ship canal to connect it with the Humber, and place it on an equality with Manchester in the matter of sea borne freights. Some surveys have been made under the auspices of the Sheffield Chamber of Commerce by Mr. Frederick Fowler, of a route from Sheffield through Rotherham and Doncaster to Goole, and some alternative routes.

Mr. Fowler estimates that it will require some 40 or 50 miles of canal to connect Sheffield with the Humber, and an elevation of 150 ft. No estimate of the cost is yet given, as that will depend on the size adopted. But as the Chamber of Commerce, which see the heavy trades of the city so seriously handicapped by railway rates as to be in danger of being lost, has pledged itself to support any satisfactory scheme, it is probable that a detailed survey and estimate will be made.

The *London Daily News*, in commenting on this proposed canal, says: "It is remarkable that nothing is heard in this country of ship railways, though in the United States the most sanguine hopes are entertained of these projects as an alternative to ship canals, and many are in actual course of construction." and advises the dispatch of some competent engineer to examine and report on Captain Ends' great Tebuanepac Ship Railway, "one of the boldest and most original of these undertakings."

Coal Trestle for the Erie.

The Erie will shortly build a new coal trestle at Hornellsville to take the place of the old one recently destroyed by fire. It will be built on a design similar to that used on the Pennsylvania Railroad, in the meadows west of Jersey City, which was illustrated in the *Railroad Gazette*, Sept. 2, 1887.

Aluminum in Castings.

The effect of the alloys of aluminum in iron and steel casting in quieting the metal and increasing its fluidity has been denied by some founders, but evidently without sufficient trial. There appears to be no doubt that cleaner, sharper and more uniform castings are to be obtained by the admixture of aluminum, and probably it is only the price of the alloys hitherto obtainable that has prevented their wider use. It has recently been announced that the Williams Aluminum Co., of New York, is now producing in commercial quantities, and putting on the market at 10 cents a pound, alloys especially adapted for use in iron and steel casting.

Plate Girders on the New York Central & Hudson River.

Bridge No. 115 of the Harlem division, above Dover Plains, was transported half a mile and dropped into place last Sunday. It is a plate girder bridge, 163 ft. long, weighing 60 tons. There being plenty of time, no attempt was made to do the work of clearing away the old and placing the new bridge in less than half a day. The raising and lowering of the new bridge to place was easy of accomplishment with two crabs and the ordinary outfit of a wrecking car.

Northern Pacific Steamers.

It is reported that J. J. Holland, a large shipbuilder at Tacoma, Wash. Ter., has been asked by the Northern Pacific to prepare plans for the construction of two screw steamships to ply between Tacoma and Alaskan ports in the summer season, and Tacoma and Hawaiian ports in the winter.

The North Chicago Rolling Mill Co.

The annual report of the North Chicago Rolling Mill Co. for the fiscal year ending July 1, 1888, shows an increase in the volume of business of 5 per cent. over that of the preceding year, the total number of tons of material manufactured having been 1,000,139, against 958,446. Gross earnings in the last fiscal year were \$13,549,487, against \$14,297,382 in the year preceding, a decrease of 5 per cent. The bonded debt of the company, amounting to \$1,000,000, was paid June 1, 1887. The balance sheet of July 1, 1888, is as follows:

ASSETS.	
Plants.....	\$5,529,292
Materials.....	2,072,883
Cash.....	415,177
Bills and accounts receivable.....	1,461,520
Stock, N. C. R. M. Co.....	13,600
Total.....	\$9,492,472
LIABILITIES.	
Capital stock.....	\$9,000,000
Bills payable.....	908,465
Surplus.....	2,588,007
Total.....	\$9,492,472

The report states that while the condition of the property is good, the prospects for a reasonably busy and prosperous year are not so good as one year ago.

The total product was 1,000,139 gross tons; raw material received, 1,304,235; pig metal produce, 347,795; steel ingots, 313,016; steel rails, 263,772; steel beams, 630; bar iron, fish plates, etc., 74,923. The company declares a 3 per cent. dividend for the half year. At the annual meeting the following officers were chosen: Orrin W. Potter, President and Treasurer; Edward C. Potter, Vice-President; Richard C. Hannab, Secretary; John C. Parkes, General Manager, Francis Hinton, Manager of the Milwaukee Branch.

Continuous Hot-air Heating.

Messrs. Moore & Lyon, two engineers, of Danbury, Conn., have invented an apparatus by which all the cars of a train can be heated by hot air direct from the locomotive. A company with \$100,000 capital has been formed to push the invention.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The Pennsylvania Company, in its summary of the reasons why the Commissioners should not interfere with through export rates, lays well deserved stress on the point that the export traffic, which being but a very small proportion of the whole, yet involves the movement of the surplus production of our most important staples, any policy which interferes with our opportunity of marketing such a surplus will, as is well known, depress the home price of these staples out of all proportion to the actual amount affected. Now if we were living in a season of inflated prices, there would be no objections, on grounds of public policy, to a system of enforced rates which should have this effect. But prices, so far from being inflated are seriously depressed. A further fall in the price of wheat would be a misfortune not merely to producers, but to all the mercantile and transportation interests of the country. Even if it were the intention of Congress to inaugurate such a policy, now is the very worst time to do it. Any gain which the domestic consumers might receive from lower prices would, under existing circumstances, be more than offset by the evil results of such depression. To attempt to cut off the chance of reaching foreign markets for our wheat and other staples would be simply suicidal. To expect the railroads to reduce all rates to the level of their export rates would be equally so. Were it a question whether we should inaugurate a policy of making differences in favor of export traffic, the matter would be a fair subject for arguments, but we can see no good result which could possibly be attained by disturbing a practice of this kind, to which trade has already adjusted itself.

In the case of the Chicago, St. Paul & Kansas City before the Inter-state Commerce Commission, the road takes ingenious ground. It says substantially this: "The Inter-state Commerce law requires rates to be reasonable. That means, among other things, that they shall afford the carriers a fair return. The Burlington & Northern is making unreasonably low rates. It is, in effect, not subject to the control of the act. As far as our business is subject to the competition of this road, we are, therefore, unable to apply the short-haul clause any more than we should if our competitor were a Canadian road or a water-route." At first sight this seems like taking advantage of a mere technicality. But we are inclined to think the argument sounder than it looks. Let us consider the underlying principle of the Louisville & Nashville case. Why is it good public policy to allow certain exceptions to the short-haul principle? Because your competitor may steal your through traffic by making rates upon it which will not pay fixed charges. The only means of self-defense for an American road against a Canadian one was to allow it to protect itself against irresponsible competition. In this case the Canadian road can make through rates which do not pay fixed charges, because it is outside of the authority of the United States law. But a road within the United States may do the same thing

from mere recklessness. To its competitor it makes little difference what is the motive. The necessity for relief is the same in each case, and there are the same sorts of grounds of public policy which demand that relief shall be given. The fact is that the short-haul clause, combined with the prohibition of pooling, puts a railroad at the mercy of its least responsible rival, and it is necessary for the Commission, as far as it can, to protect legitimate railroad interests from the results of this state of things. If the clause prescribing that rates shall be reasonable can really be construed as meaning that they shall not be unreasonably low, there seems to be every reason for giving the railroad the protection it should afford.

The law has the effect of making the whole system of rates of any road, through and local, depend upon the uncontrolled action of a rival. It is desirable to give all the protection which we can under these awkward circumstances. The reason which will make the Commission hesitate to take this view of the matter is that it will add greatly to the difficulty of enforcing the law. If A, when accused of an illegal act, is at liberty to justify himself by saying that B began the trouble, the contest can be carried on upon this line until the original issue is lost sight of. A law is strong only when each party can be held responsible for his own illegal acts. But here is a case where, owing partly to the technical peculiarities of railroad business, and partly to the prohibition of pools, each party is not responsible for his own acts. If you hold him responsible, you do violence to the facts in the case. If you do not, you make the law a dead letter. Such is the disagreeable alternative which the Commission has to face.

A new chair, that of Engineering Practice, has been created at the Stevens Institute of Technology, and endowed by President Morton. Mr. Coleman Sellers has been selected as the first professor, and gave his first lecture just before the close of the last school year. The qualifications of this gentleman as a mechanical engineer are of the highest order and the students of the Stevens Institute may be congratulated on their good fortune in having as a professor an engineer who has been remarkably successful, and whose practical experience covers a period of unexampled mechanical progress. Any systematic instruction in mechanical engineering has hitherto been somewhat imperfect in most of the colleges and technical institutes which deal especially with the education of engineers. Professor Sellers will doubtless do much to supply an acknowledged shortcoming, and will fitly inaugurate the important advance.

Among the many small improvements which have been unaccountably delayed is the general adoption of a provision for making a tight coupling between the tender and the first car of a passenger train. The absence of such a connection and the use of a loose link necessarily involves slack, which causes a jerk whenever the train is stopped or started. As passengers are often on their feet at such a time, they are occasionally thrown down, and often inconvenienced by the retention of a relic of barbarism in a train otherwise fitted throughout with not only the latest improvements, but the newest freaks of fashion in ornament and luxury. There are many devices whereby the Janney or the Miller drawbar on the first car can be properly connected to the tender, and it is singular that these devices have not generally superseded the loose link. The mechanical difficulties of the problem having been overcome the question of expense only remains. This certainly ought to have no weight, for if the loose link should be retained on the hind end of the tender because it is cheap, it ought to be used on every passenger car for the same reason. The safety of the train hands as well as the convenience of the passengers demanded the substitution of the more costly vertical plane drawbar for the loose link on passenger trains, and the change has probably paid for itself in the saving in car repairs alone, to say nothing of the gain in time, safety and convenience. The connection between tender and train is a very important one, and it is difficult to see, on general principles, why the same reasoning should not apply with equal force to this connection as to others in the train.

A correspondent writing from Santiago, Chili, tells us that the last lot of rails purchased for the Chilean roads was 6,000 tons, which were contracted for at the price of £5 6d. on board ship at Valparaiso—"a much better figure than our own makers give." This order was taken by first-class German makers. The writer adds that "German manufacturers threaten far more danger than cheap Chinese labor." Some of our readers no doubt noticed statements of the same general tendency in the notes on railroads in China,

published in the *Railroad Gazette*, July 13. An obvious preference for many articles of American make is indicated by the officials of the Chinese railroads, but even when the American design is followed, it is found cheaper to have the material made in England or Germany. Cars of the American style are used, but the wheels and axles are German, and the truck frames English. Locomotives of the American type for the Taku-Tientsin road were built in Glasgow. Trucks of our own M. C. B. standard cost 37 per cent. more than they could have been got for from Europe. An American-built bridge cost 80 per cent. more than one of the same type from Glasgow, and although the American bridge was of better metal than the English, and the prices being equal, would for that and other reasons be preferred, the greater cost will probably prevent a repetition of the order. In short, our Chinese correspondent, like him who writes from Chili, says that "at present the United States cannot compete with English and German firms." A striking example of the same kind is seen in the great Hawkesbury bridge, that monument of American skill and enterprise, now going up in a British colony. It is designed by American engineers and built by American contractors, but the iron is made in Great Britain. Even the eye bars, which were made here, are from foreign blanks. Americans ought to build the bridges, and build and equip the railroads, of the world, or at least of that part of the world in which the large development of these industries is just beginning. In these foreign countries, other than Great Britain and the European continent, in which railroad building is likely to be the most extensive in the next few years, American locomotives, cars and bridges are known and appreciated, but the skill of our engineers and mechanics is neutralized by the high prices of our products. The South Americans and the Australasians, and even Englishmen in China, want what we have to sell, but they cannot afford to buy it.

"The sun do move." If any one does not believe it let him read the circular just issued by the Board of Direction of the American Society of Civil Engineers, and printed in another column of this issue. The Transactions of the Society will be sent to any subscriber who pays the subscription price, which is not cheap, but perhaps could not, in justice to members, have been made less. Papers, communications and discussions are invited also from all persons, whether members of the Society or not. To say that all this seems too good to be true is putting it mildly. It is startling, it is almost revolutionary. For years the Society has chosen to limit its usefulness and increase the pecuniary burden of membership by restricting the pages of the Transactions to papers read by members only, and by limiting to members so far as possible, the circulation of the published transactions. This last statement is not absolutely true, for the numbers of the Transactions have been on sale at various prices, but unless a man happened, through his reading or otherwise, to know that a paper on a certain subject had been published by the Society, and that by addressing the Secretary he could find in what issue that paper had appeared, and the price of it, and perhaps obtain it; unless a man knew these facts, and was willing to take some trouble, no sales could be made. Naturally the circulation of the Transactions outside of the membership has been very small. The first cost of the most expensive part of publication has been as great for, say, 1,500 copies as it would have been for 3,000, or any greater number, and the postage account has been unnecessarily great, for the reason that the Transactions, having no subscription list, could not pass through the mails at second class rates. Therefore, members have paid for the restrictions which have been placed upon the spread of the fame and usefulness of the Society. The step now taken is important in that it throws open the publications to public subscription, but it is still more important in that it opens the pages of the published Transactions to an increased number of contributors. Theoretically one would say that the interest and value of the meetings and the published records will be decidedly increased, but how the new plan will work out in practice must be proved. It is, however, not a matter of doubt that some important monographs have never seen the light at all, or have been published through other channels, that might with honor to the Society have been given to the world through the Transactions. For instance, Dr. Dudley's celebrated paper on steel rails, which was so widely read and discussed, and the effect of which still endures, was, we believe, offered to the Society, and finally declined because the author was not a member.

Fast Passenger Trains.

The interest taken in high speed and fast runs has always been very great, and the fact that a leading New York daily should think it worth while to cable over a column in small type concerning the run of a fast English train, shows that the general public take an interest in hearing, at least, accounts of high speed. Whether the great body of travelers care to pay for such a speed is a more open question; but it seems probable that within a few years more stress will be laid upon high speed than at present.

Owing to our great distances, in no country is the time gained by higher speed so great as in our own. For instance, the Chicago limited trains now leave New York at about 9 or 10 in the morning and arrive in Chicago at the same hour next day. A business man must, therefore, spend a day and night on the cars. Were it possible to run at 50 instead of 40 miles an hour, including stops, some five or six hours would be gained in the busy part of the day, and a train leaving New York at 3 in the afternoon would still reach Chicago in time for business, while at this end, the merchant could attend to his correspondence and do nearly a full day's work.

The run of the Scotch express referred to is not a special run made to show the maximum speed that can be attained under exceptionally favorable circumstances, but is an effort to run a regular train at a higher speed than has hitherto been thought possible. An examination of the means employed to attain the result may therefore be useful, especially as the example seems likely to be followed.

The acceleration of the trains between London and Scotland by the three rival routes has been previously referred to in these columns. The fastest time for some years was 9 hours between London and Edinburgh, a distance of 392½ miles by the shortest or east coast route. This time has been reduced to 8 hours, giving a "journey speed," that is including stops, of 49 miles per hour. This train formerly stopped 20 minutes for dinner, and if this practice is still adhered to, the average speed of the train while in motion—the "running speed" (excluding stops)—must be over 52 miles per hour, which is a very high speed to maintain in all weathers, up hill and down dale, threading crowded junctions where semaphore arms which must be obeyed, are nearly as plentiful as leaves in a forest. According, however, to the account cabled to the *New York Times*, the West Coast or London & Northwestern and Caledonian route to Scotland have picked up the gauntlet, and have run a train from London to Edinburgh, 400 miles, in 7 hours 52 minutes, including three stops, one of which was for dinner. The train on its first trip arrived 8 minutes ahead of time, and while the time in motion according to the schedule was 7 hours 25 minutes, the actual time was 7 hours 13 minutes, giving a speed of 55.4 miles per hour. The speed, including stops, was very nearly 51 miles per hour, which is unprecedented for any distance.

The more level portion of the route, where the grades seldom exceed 30 ft. per mile, was traversed at a running speed of 53 miles per hour, the time from London to Crewe, 158 miles, without a stop, being 2 hrs. 58 min. This performance was made by an engine of the Lady of the Lake class, built nearly 30 years ago. As the whole engine in working order weighs less than the weight on the four driving wheels of many modern engines, it shows that great and long-continued speed can be obtained by an engine of the very moderate weight of 60,000 lbs., of which only 26,000 lbs. is on the single pair of 90 in. drivers. The tractive force given by the 16 × 24 cylinders is only 68 lbs. per pound average pressure in the cylinders, or little more than half the cylinder power of an American express engine of the usual type with 19 × 24 cylinders. The ports, however, in the smaller cylinder are larger in proportion to the area of the piston than those in the 19 in. cylinders, and as the piston speed is slower, owing to the smaller number of revolutions made per mile by the big wheels, the speed of the exhaust through the passage is considerably less in the big wheel engine, and hence the loss of pressure by friction and wire-drawing is less, and at a high speed it is probable that the tractive power of the two engines would be very similar. The weights are given as: engine, 60,000 lbs.; tender, 56,000 lbs.; train of four eight-wheeled cars, 179,000 lbs. This gives a total weight of 132 gross tons, and, assuming an average train resistance throughout the run of 20 lbs. per ton, the average tractive force would be 2,640 lbs. This gives a co-efficient of adhesion of $\frac{1}{10}$, a figure which explains why a single pair of driving wheels have ample adhesion for a light train. The average pressure on the piston would be about

30 lbs. per sq. in., and the average I. H. P. would be about 400. These figures show that long continued high speed can in practice be obtained by engines of very moderate weight and power. The high speed of this train was evidently not attained by the novel construction or exceptional weight or power of the locomotive. The main causes must be sought elsewhere, and in a direction which has been pointed out in these pages.

Good signals and an unobstructed track enabled the engineer to run at a steady pace without slacking for crossings and possible trains ahead. The light weight of the coaches did not unduly tax the engine on up grades, and as the train would seat about 150 passengers, it is probable that even if only one-third full, it could be run at a very handsome profit. The expense of running such a train in England may be taken at about 40 cents per mile, while 50 passengers at 2 cents per mile would yield \$1 per train mile, leaving a profit of 60 cents.

Having briefly analyzed the performance of this train under a combination of a light engine, a light train, easy gradients and a clear track, it is interesting to note its further progress under somewhat changed conditions. North of the Scottish border the grades are long and severe, but the weight of the cars remained unaltered and the runner could still depend absolutely upon distant signals placed at least 1,000 yards in advance of the danger point or stop signal. He could therefore run downhill even at 75 miles an hour, with confidence that he would receive due and trustworthy warning of any danger ahead. To offset the heavy grades a heavier engine of a somewhat novel type was employed. This engine, which was built by Messrs. Neilson, of Glasgow, has, like the other engine, only a single pair of drivers, but, unlike her, the cylinders are inside connected, and the front end of the engine is carried on a four-wheeled truck. The engine was in the exhibition held in Edinburgh in 1886, and was a fine specimen of workmanship. The weight in working order is 94,000 lbs., and the cylinders are 18 in. by 26 in., the drivers 7 ft. diameter, and the adhesion weight is 38,000 lbs. The extra weight and power of this engine resulted in a performance of which her designer, Mr. Dugald Drummond, may well be proud. She ran from Carlisle to Edinburgh, 101 miles, in 104 minutes.

When the length and character of the grades are considered, this run certainly throws into the shade all others of which there are any authentic records. The worst grade is 70.5 ft. per mile, for seven miles, and the *New York Times* account states that the engine ascended a grade 66 ft. per mile, 10 miles long, at 44.5 miles per hour. The total weight of the train being about 348,000 lbs., and the frictional resistance for that speed being assumed at 12 lbs. per gross ton, the gross resistance would be 6,200 lbs., or about one-sixth of the weight on the drivers. The tractive power per pound average pressure in the cylinders being 100 lbs., the average pressure on the pistons would be 62 lbs. per sq. in., and the engine would exert 744 I. H. P. It will be seen that the weight and cylinder power of this engine were 50 per cent. in excess of that of the Lady of the Lake, and that the larger engine in climbing this long grade exerted nearly double the horse-power of the smaller engine when running on a more level track. The total heating surface of the engine, including fire-box, is 1,085 sq. ft., and she has 17.4 sq. ft. of grate surface.

It will be pretty clear from the foregoing figures that this exceptionally fast run was not obtained by any exceptionally expensive or elaborate means. While this fact reflects great credit on the skill of those concerned, it shows that higher speeds are more nearly within our reach than most people have considered possible.*

The Road Masters' Conventions.

The regular annual meetings of those two important bodies, the New England Road Masters' Association and the Road Masters' Association of America, will soon take place—the former at Boston, Aug. 15 and 16, and the latter at Washington, Sept. 11, 13. But few topics have been chosen for report and discussion at these meetings, but they are quite enough and the New England Association has laid out work enough, under the head of "steel rails," for a much longer meeting than is to be held. This Association has fixed upon six subjects for reports, and the American has five, and having in mind the industrious habit of the organizations, it is not too much to expect that their discussions will be thorough, and of real value.

The road masters, in their meetings, might well congratulate themselves on the great improvement in track which has taken place within a few years, and

* A comparative table of the speed of this and some other runs is given on another page.

which, so far as one can judge from statistics covering the whole country, is steadily going on. Perhaps the best measure of this, certainly the only available one, is to be found in the *Railroad Gazette's* record of accidents. It will be seen, by looking at the table of train accidents for 15 years, from 1873 to 1887 inclusive, that there were reported in that time a total of 2,285 derailments from defects of road, but of these 415 were failures of bridges and trestles. The total, therefore, to be charged to the track department is 1,870. Taking an average of the first three years and the last three years of the period covered, we find that the derailments chargeable to track were 141 per annum in the first period, and 152 in the last. Meantime the miles operated doubled, and the train mileage undoubtedly more than doubled. There should therefore have been more than 300 accidents of this class instead of 152, had track not improved. Or, putting it another way, there were little over half as many derailments due to defective track in 1887 as there were 15 years earlier. Something of this improvement may be credited to the introduction of steel rails. In the three years 1873-5 the derailments reported from broken rails were at the rate of 86 per annum, and in the three years 1885-7 they were 65 per annum. Even this improvement, however, may be quite as well attributed to better road-bed as to the rails themselves, for the iron rail perhaps would fail in such a way as to cause an accident no oftener than the steel rail. Of the 1,870 accidents under consideration 935, or just one-half, are attributed to broken rails.

The accidents from "loose or spread rails" in the same period were 656, and these have apparently increased in a greater ratio than mileage and traffic; that is, from 23 per annum to 59 per annum. This, therefore, is a class of accidents into which the roadmasters might well inquire carefully. We are of the opinion that the showing of the figures is delusive, however, and that "rail spreading" happens much less often than appears from the reports. There are with newspaper reporters two favorite causes of accidents, spreading of the rails and failure of the air brakes. When no other cause is obvious one of these is pretty sure to be given; and, in the majority of such cases, where it has been found practicable to inquire into the minor accidents, we have found that they were due to neither of these causes. From many such cases we conclude that accidents are frequently ascribed to defective track which are really due to defective equipment. Nevertheless, it can hardly be doubted that loose or spread rails remain among the most fruitful causes of the accidents due to defects of track, and it would be well for the roadmasters to collect and compare undoubted statistics on the subject, and determine whether or not sufficient pains are taken in ordinary practice to secure good spiking and sound ties.

In the table from which these data are taken the accidents due to defects of road were for 15 years, as has been said, 2,285. The special causes assigned were: Broken rails, 935; loose or spread rails, 656; failure of bridge or trestle, 415; broken or defective switch, 128; broken or defective frog, 91; broken or defective joint, 32; bad track, 26. It is only from spread rails that the accidents seem to have increased more rapidly than the mileage and traffic.

It is of passing interest to present here statistics of accidents coming from other causes, that the roadmasters may compare their own short comings with those of other departments. In the fifteen years the collisions were 6,301, and the averages per annum were, 1873-5, 310, and 1885-7, 555. The derailments from defects of equipment were 1,316, and the averages per annum were, 1873-5, 79; 1885-7, 115. The derailments from negligence in operation were 1,365, and the averages per annum were, 1873-5, 98; 1885-7, 71. The derailments from unforeseen obstruction were 2,053, and the averages per annum were, 1873-5, 167; 1885-7, 143. The unexplained derailments were 3,195. These accidents, it will be seen, were more numerous than those of any other class of derailments, and were surpassed in number only by the collisions. Amongst these there were, no doubt, a good many that would have been charged to the road department had all the facts been known. It is fair to say, however, that the unexplained derailments have diminished materially in the fifteen years. The averages were 252 per annum in the period of 1873-5, and 193 per annum in the period 1885-7.

Economical Wages.

A press dispatch states that the Philadelphia & Reading has reduced the monthly wages of trainmen on a short branch, where the traffic does not pay, to \$75 for engineers, \$70 for conductors, and \$45 for brakemen, these figures being from .13 to .24 per cent. below

the prices hitherto paid. We dislike to take the Philadelphia & Reading as a text, for this action is not different in principle nor greatly different in effect from that taken by many other roads; but the case is an illustration of a practice which is of such a nature that it should be resorted to only when the best of reasons for it exist. It is said that the men were in this case offered the alternative of taking new positions on the main line. This somewhat mitigates the case so far as the men are concerned, but does not lessen the evil of the principle so far as the public is interested.

What is a reasonable minimum rate of wages for passenger trainmen, brakemen for instance? No doubt men could be got to do the work for 10 or even 20 per cent. below the reduced rates just established, and if the law of supply and demand were absolutely followed the absurdities now witnessed in rate making might be repeated in wage paying. The difficulty in finding men to fill vacancies would be the only limit to reductions. Experience in other departments of railroad service has clearly shown the operation of a policy of this kind. Many telegraph superintendents and trainmasters are constantly confronted with the dilemma in filling vacancies at small stations, of either taking up with poorly qualified applicants or spending a great deal of time and labor hunting up good men. When it comes to using \$50 worth of a superintendent's time to find a station agent for a position which he will promote himself out of in a year, it is a fair question whether the superintendent should not be furnished with a more powerful lever with which to pry men into such positions.

The general qualifications of men, those characteristics of mental and moral behavior which lead us at once to see great differences between men whose performance of routine duties is nominally uniform, should be the principal criterion in fixing a minimum rate of pay. Two brakemen can learn the flagging rule by heart, be on hand seasonably, and dress in a passable uniform, with equal faithfulness and regularity; but the difference in value of the two men, as indicated by alertness, good judgment, good temper and other traits may be great, and it is these latter points that should be carefully considered. The general calibre of the man, before we consider his brakemanship, is an indispensable gauge of his fitness as a guardian of passengers' lives. The facts that he has worked on a train a certain number of months and can correctly name the stations, or do a dozen other duties incident to his position, are not enough. If general ability to appreciate the responsibilities attendant upon the care of a train load or even a small car load of passengers is a chief qualification in a passenger brakeman, where are we to draw the line between branch trains and those on the main line, or between express trains and those of lesser importance? General vigilance, coolness of temper and intelligence are required on every train; at least no superintendent will admit that he tolerates a lack in these respects if he can help it. Civility and politeness are essential on a train with even a half dozen passengers; or at least they should be.

The average brakeman is certainly none too good for the very lightest passenger train, and it would seem that the proper way to adjust the grades would be to establish a minimum standard of qualifications for the poorest train, and raise it for others, rather than take the most numerous class of trains for a standard and lower it according to income. The interests of stockholders who may have to go without any income on their shares are, of course, cited in comparison, but it would be just as fair to buy poor wheels or poor boiler iron, with a view of saving money to put into dividends, as to buy poor service. Why is the superintendent of machinery given authority in buying material to get the best that money can buy, while the division superintendent is required, in hiring men, to fit the men to the pay rather than to the work they must perform? Superintendents now have to put comparatively green men on passenger trains, because freight men do not regard it as promotion to take places where they must work about as long hours at the same pay as before and bear the additional expense of better clothes, while the place involves dealing with the public, which may necessitate occasional unpleasant visits to the superintendent's office. If passenger trains are to be run entirely by machinery it would perhaps be well to have porters instead of brakemen, and let them wear slippers and white coats as do Pullman's porters. So long as we have so few brakemen who are fit for conductors, and so few conductors who can pass a satisfactory examination on train rules, it would seem the part of prudence to try and bring the work up to the pay instead of bringing the pay down to the work.

Brakemen being employed largely for their usefulness in emergencies, it is proper to graduate the pay so that the best men will be glad to work on those trains most liable to emergencies, and it is fair to allow additional pay to those who run on trains where passengers are allowed a finger bowl every 25 miles and have their coats brushed four times in a day's trip. Brakemen on these trains must dress with neatness, and that involves some expense; on ordinary trains some laxity can be—or at least is—tolerated in this respect. It is also proper to pay higher where the amount of work is unusual, though it is hard to find those places on passenger trains nowadays. Aside from these three considerations there should be no difference to a road in the value of its different passenger brakemen.

We have considered brakemen chiefly. For conductors the policy of paying good and even liberal wages merely to fortify the men against financial temptation is very generally approved by the best superintendents. As for engineers, the policy of most roads in their dealings with this class is a complete justification of the arguments we are here using. Employés in other departments have a feeling, however, that engine-runners secure consideration because they are organized, and that similar treatment is denied other classes simply because they are not organized. Reductions of 15 and 20 per cent. in wages at one stroke justify this feeling.

Engineers and the Public Works.

In some editorial comment on the Cullom-Breckenridge bill to establish a National Bureau of Harbors and Waterways, *Engineering News* advocates a national school of civil engineering, or, perhaps, a school of public works engineering, and is of the opinion that "this change in training and the recruiting of a force more equal to the work on hand would meet all the present requirements, with or without a change in the name of the controlling body." We should consider it a misfortune if any influence or effort were wasted in the support of a suggestion to which there are so many and such serious objections.

In the first place there is no movement to establish a national school of engineering nor any immediate or remote prospect of such a school. There is, however, a fair chance that the Cullom-Breckenridge bill may become a law, if it is supported by the influence of the profession. One remedy is in sight, the other could only be secured, if at all, after a long time spent in agitation and organization. If, therefore, the two plans were of anything like equal value it would be wiser to try to advance that one which seems attainable within one generation. But the two plans are not of anything like equal merit.

One purpose of the Cullom-Breckenridge bill is to change the nature of the organization under which the technical work is actually carried out on certain great public works. The change proposed is to admit to equal privileges, rank and consideration in the working corps all engineers, whatever may have been the circumstances of their education. This purpose is important, and in itself worth fighting for. To accomplish it would alone be a great step; but a national school of engineering would not accomplish it. Such a school would merely enlarge the corps without materially changing its character. It would still be a group of men educated by the government, in one way, and at one place, for the government works, and the inestimable advantage of recruiting the corps from the graduates of all the technical schools of the country would be lost. So far as the efficiency of the corps is concerned the great objects of any change in its personnel are to eliminate the bureaucratic spirit which is so hard to separate from life service in government employ, and to attract men of talent and high character by offering them the chances of a high career. We could not hope to get a higher sense of personal honor or public duty than now exists in the Corps of Engineers. A great gain in efficiency in the corps of public works engineers is to be got only by attracting to it high class civilians from the whole body of the profession. To restrict the service to the pupils of one school would be but a small gain over the present system, and, in fact, it is quite as likely to be a loss as a gain.

But in this proposition for changing the character or method of recruiting the corps of engineers who are to carry on the work of the harbors and waterways, the most important purpose of the Cullom-Breckenridge bill is quite ignored. That purpose is to change radically the way in which plans of river and harbor improvement are conceived, elaborated, provided for and executed. It is proposed in that bill that these works shall be systematically and harmoniously developed, due regard being paid to their

relations to each other and to the public good; that they shall not be begun until they can be steadily prosecuted to completion; that appropriations of public money for them shall be regulated by considerations of good public economy, and not by political considerations. This purpose of the bill is of far greater consequence than that other one which greatly concerns only the men employed to do the work; but on this vital purpose the national school would have no bearing whatever.

There is still another objection to the plan of our contemporary. It would be a pernicious and entirely unnecessary enlargement of the field of operation of the general government. The country abounds in good technical schools. Indeed there are half a dozen of the highest excellence, and several more that are more efficient than any government school could be for years to come. It may be said that no particular stress is laid upon river and harbor hydraulics in the existing technical schools, but let a career in that branch of engineering be opened and the opportunities for special education will be quickly provided.

There is no reason why the general government should make any further essays in technical education, except for military and naval purposes, and there are very conclusive reasons why it should not. There are, however, very great and obvious and well-known reasons why the whole present system of river and harbor work should be changed; but the most important and pressing change is in methods and not in men. This the Cullom-Breckenridge bill may bring about, or it may not; but at least it is the only plan which now offers any rational chance of bringing it about.

A London journal makes the announcement—"important if true"—that the Hudson tunnel is to be taken up and completed under the superintendence of Sir John Fowler and Mr. Benjamin Baker. The bonds are to be placed on the market in London as well as in New York, an issue of \$1,500,000 being made in London and \$1,000,000 in New York. The trustees named are the Farmers' Loan & Trust Co. of New York; the Lord Balfour, of Burleigh, Deputy Governor of the Bank of Scotland; the Hon. Reginald A. Capel, director Great Northern Railway; Lord Claud J. Hamilton, M. P., Deputy-Chairman Great Eastern Railway; Alexander Hubbard, Esq., J. P., director Great Western Railway; Henry J. B. Kendall, Esq., director Railway Investment, and Major-General H. Rivers, R. E., director Great Indian Peninsula Railway Companies.

We can get no confirmation in New York of this announcement, but negotiations with English capitalists have gone on for some months. When Mr. Baker was here recently, he examined the tunnel and is said to have thought well of the project.

The latest scheme to make New York a way station is to bridge the Harlem and East Rivers by way of Randall's and Ward's Islands to Astoria. Then a "broad viaduct railroad" will be built through Brooklyn to near Fort Hamilton. At this point in the project Mr. Erastus Wiman will enter, and will tunnel under the Narrows. Once the railroad is landed safely on Staten Island there will be no more trouble, for the Arthur Kill Bridge, and the Baltimore & Ohio will take up the tale, and the tide of commerce between New England, and the rest of the Union will flow freely past our doors without paying tribute to the pernicious middlemen of New York. We don't see how anything but the Inter-state Commerce Commission, backed up by some more laws of some kind, can save this metropolis.

New and extensive borings and soundings have been made to determine the character of the bottom of the Detroit River with reference to building either a bridge or a tunnel, and profiles are in preparation. The deepest water is said to be 52 ft. and rock was encountered at from 72 to 92 ft. The bottom is chiefly clay.

"Change here for Beersheba, Dan and Jericho," will soon be a sentence which will tax the pronunciation of Israelitish brakemen, for the London *Engineer* states that the railroad, which it appears is actually to be built between Jerusalem and the Mediterranean, will commence at the port of Jaffa, and run in a southeasterly direction by Yazur, Beit-Dejan, Ludel, Yalo, Soba and Kustul to Jerusalem. Its length will be 33 miles. The construction will be attended by engineering difficulties in consequence of the barren and hilly nature of the country through which the line will run. Jerusalem is situated some 2,624 ft. above the level of the sea, and the territory in its vicinity will tax the ingenuity of the engineer.

The report that the Mansell retaining ring has been definitely adopted as the standard tire fastening of the Pennsylvania is incorrect. It has been used on steel-tired car-wheels to some extent and has given good results, and is considered to be correct in principle, but has not been used for locomotive drivers or made standard.

The Railroad Commissioners of Kansas have issued a circular to all the railroads in the state, calling their attention to the fact that prudence requires that the towns of Kansas begin early to lay in a supply of fuel for the coming winter,

and asking the roads to strongly urge all dealers to take action at once instead of waiting, as is frequently done, until the commencement of cold weather. Both the population and the mileage of railroad has largely increased during the past year, and it is believed that the increase in facilities for mining coal has not kept pace with the increasing demand. Several instances of actual suffering for fuel during blockades of the roads occurred last winter in the Northwest as well in Kansas, and it would be well if the precautions advised by the Kansas Commissioners should be taken in many other localities.

Recent conferences between the presidents and other high officers of the Union Pacific and the Northern Pacific have given wide circulation to the rumor that the troubles about the joint lease of the Oregon Railway & Navigation Co.'s lines will soon be settled. This joint lease has always seemed so vital to the rational division of territory that we have seen its delay with regret. If these two great companies can agree to refrain from duplicating lines in a thinly settled country, and from otherwise wasting each other's money, it will be a substantial gain for the party of peace and reason in railroading.

The electric street railroads have caught the vestibule malady. At least, it is now said that the trains on the road building by the Thomson-Houston Co. in Omaha will consist of two cars with a vestibule between them. It is further said that "the fact that the trains are to be vestibuled will, it is thought, make the road popular as well as attract to it the attention of street railroad managers in all parts of the country." In this last sentence probably lies the secret of the vestibule.

A paper entitled "Mechanical Pathology Considered in its Relation to Bridge Design" will be read before Section G of the British Association for the Advancement of Science at the forthcoming meeting in September. The author of the paper is Mr. G. H. Thompson, Bridge Engineer, New York Central & Hudson River Railroad, and it will be presented by Mr. Benjamin Baker, of the Forth Bridge.

NEW PUBLICATIONS.

An Index to Engineering Periodicals, 1883 to 1887, Inclusive F. E. Galloupe, 30 Kilby street, Boston.

This little volume of 294 pages is "designed to make accessible the more important papers and articles contained in leading American and English periodicals during the last five years." The number of references has been limited to about 10,000. The limits which the compiler set for himself necessitated excluding the proceedings of societies, and in fact the references are to but 19 different periodicals. Within the limits of time and space thus deliberately set the compiler has made a handy subject index which is sufficiently full to be of great use.

TECHNICAL.

Locomotive Building.

The Portland Locomotive Works, of Portland, Me., have just completed a large passenger locomotive for the Maine Central. The tender is provided with apparatus for taking up water while the train is in motion.

The Manchester Locomotive Co., of Manchester, N. H., is building 10 locomotives for the Boston & Maine.

The Baldwin Locomotive Works, at Philadelphia, Pa., have nearly completed five new passenger locomotives for the Columbus & Western Division of the Central of Georgia. The contract for building two locomotives for the St. Cloud Sugar Belt road has been let to the Baldwin Works. The contract for building twelve freight and passenger cars has also been let.

Car Notes.

J. K. Harris & Co., of St. John, N. B., this week delivered to the Canadian Pacific ten of a lot of box cars they are building for that road. The addition to the works is now being built, and will be used for finishing wheels and for a pattern shop.

The James Crossen Car Works, of Coburg, Ont., have completed five sleeping cars for the Intercolonial, and three more will soon be finished.

The Central of Georgia recently closed a contract with the Roanoke Car Works, of Roanoke, Va., for building 1,000 new box cars and 2,000 ore dump cars with a capacity of 60,000 lbs. each. The cars are for the Columbus & Western division, and it is thought that contracts will soon be let for building another lot.

The Ohio Falls Car-Works, of Jeffersonville, Ind., are building 100 flat-cars of 40,000 lbs. capacity for a Southern road.

The New York & New England has recently completed 21 passenger cars at the Norwood shops. Fourteen more are being built and will soon be completed.

Bridge Notes.

The County Commissioners of Hampden County (Springfield), Mass., want bids until Sept. 29 for an iron lattice bridge over the Connecticut River at Holyoke. It is to be about 1,000 ft. long and 46 ft. wide in the clear, with sidewalks of 8 ft. each side.

The New York Central & Hudson River Co. has awarded the contract for the Norman's Kill bridge, on the Albany branch of the West Shore road, to the Hilton Bridge Co., of Albany, N. Y. The bridge is a lattice structure, 80 ft. span, single track.

Proposals are wanted until Aug. 15 for the construction of several bridges in Dodge County, Neb. Address P. H. P. Shively, County Clerk, Fremont.

Proposals are wanted until Aug. 14 for erecting an iron road bridge across the middle branch of the Croton River at South East Reservoir, Putnam County, N. Y. Address the Department of Public Works at New York City.

A bridge is to be constructed over the Lorenz River at Santa Cruz, Cal., by the City Council.

It is reported that an iron bridge will be erected over the Lone River, at Belton, Tex., by the County Commissioners.

The County Commissioners will build a bridge, to cost \$5,000, at Waupaca, Wis.

Hoffman & Bates, of Portland, Or., have been awarded the contract for building the bridges and trestles on the extension of the Oregon Railway & Navigation Co.'s road from Farmington to Mullan, Coeur d'Alene, Mont. The firm has just completed the Northern Pacific bridge across the Columbia River at Kennewick, Wash. Ter. This it said to be the largest bridge on the coast, and to have cost about \$600,000. There are nine fixed spans of 250 ft. each of wood and iron, and an iron draw span 230 ft. long. The piers are of piling cut off 7 ft. below the surface, with ribs filled with concrete on top. The bridge was far enough advanced to allow of trains being crossed on the false work in December, but its completion was retarded by ice taking out the false-work under seven spans at one time, causing a long delay.

The County Commissioners have let the contract for the Howe truss bridge to be erected over Waxahatchie Creek, Shelby Co., Ala., to A. King. The bridge will be 250 ft. long, with one 200 ft. span.

The following bids were received by the Commissioners for a bridge across Bear River, Nevada Co., Cal.: California Bridge Co., \$5,121; Pacific Bridge Co., \$4,294.75 and \$3,725; American Bridge Co., \$3,575; I. S. Walker, \$3,250; O. A. Thomkins, \$1,725; W. S. May, \$3,348. The contract was let to the American Bridge Co., of San Francisco.

It is stated that the Baltimore & Ohio will erect an iron bridge over the Cheat River at Rowlesburg, W. Va.

Bids for the Butte City bridge have been opened as follows: San Francisco Bridge Co., \$35,000; San Francisco Contracting Co., \$33,700; King Iron Bridge Co., \$34,600, \$29,400, \$27,900; California Bridge Co., \$31,100, \$29,800.

The following bids were received by the Clerk of the Supervisors of San Francisco for building bridges over the North Fork Kern River: M. W. Morris, \$3,250; McKinnon & Tumulty, Stockton, Cal., \$5,195; William McDonald, Oakland, Cal., \$5,200; Joseph Cyrus, Kernville, Cal., \$4,880; Pacific Bridge Co., San Francisco, Cal., \$5,200; American Bridge Co., San Francisco, Cal., three bids, \$5,150, \$4,950 and \$2,950; San Francisco Contract Co., San Francisco, Cal., \$5,700; San Francisco Bridge Co., San Francisco, Cal., \$4,200. Over the South Fork Kern River, M. W. Morris, \$1,700; McKinnon & Tumulty, \$2,599; William McDonald, \$2,070; Mark Wyatt, Kernville, Cal., \$2,100; Joseph Cyrus, \$2,850; American Bridge Co., \$2,500 and \$4,500; San Francisco Contract Co., \$3,500; San Francisco Bridge Co., \$3,300. Bid for both North and South Fork: D. C. Tolman, Kernville, Cal., \$5,735. The contract for the South Fork bridge was awarded to William McDonald. The contract for the North Fork bridge was awarded to American Bridge Co., at \$5,150.

The following proposals for erecting two new iron bridges on the Medina River were opened July 24 by the County Commissioners of San Antonio: E. Braden, \$15,487; James Reed, \$13,990; S. P. Maury, \$14,444; Smith Bridge Co., \$25,800; Pennsylvania Bridge Co., \$20,729; Missouri Valley Iron Bridge Co., \$20,991; Berlin Iron Bridge Co., \$21,215; Wrought Iron Bridge Co., Canton, O., \$20,557; King Iron Bridge Co., \$20,090; Variety Iron Works Co., \$21,141; St. Louis Bridge & Iron Works Co., \$20,625; Kansas City Iron Bridge Co., \$20,726; R. G. Nixon, \$20,645.70. The contract was awarded to James Reed.

The following proposals have been received by the County Commissioners, at Lancaster, Pa., for the construction of the bridge, 60 ft. span, over Coon Creek, at Kinseyville, Little Britain township. The bridge companies presented their own plans, while the other bids were on the Commissioners' plans: Mt. Vernon Bridge Co., Mt. Vernon, O., \$12,500 per lin. ft.; Columbia Bridge Co., Dayton, O., \$750.88, \$937, \$1,040; King Iron Bridge & Mfg. Co., Cleveland, O., \$832; Pittsburgh Bridge Co., Pittsburgh, Pa., \$785; Dean & Westbrook, New York, \$877, \$843; Wrought Iron Bridge Co., Canton, O., \$882, \$950; E. McMellen, \$1,597 and \$1,747; Jacob Kauffman, \$1,670; Geo. E. Jones, \$1,689; J. F. Stauffer, \$1,950; Frank Follinger, \$1,595; Milton Walker, \$1,123; A. S. Urban, \$1,225; Samuel Stauffer, York, Pa., \$785, \$650, \$575, \$746 and \$686. The contract for the superstructure was awarded to the Columbia Bridge Co., and for the masonry to B. F. Worn, of Providence township.

Horatio Pearson, Auditor, Troy, Miami County, Ohio, will receive bids until Aug. 28, for building an iron bridge, 398 ft. long; two spans of 166 ft. each, and one of 66 ft. The bridge is to have a capacity of 100 lbs., and a factor of 4.

The Central of Georgia will erect a new iron bridge over the Ocmulgee River at Macon, Ga.

A stone arch will be built to replace the bridge on the Blackinton road at Greylock, Mass.

The Columbia River Bridge, at Pasco, Wash. Ter., has been completed. Assistant Engineer Huson, of the Northern Pacific, had charge of the work.

The Rio Grande Bridge & Tramway Co. has placed its bonds, and will soon begin the construction of the bridge at Eagle Pass, Tex.

The County Commissioners will erect a new iron bridge at Armourdale, Kan., at a cost of about \$25,000, to replace the present one.

The following bids were received for erecting the bridge at Downey Avenue, Los Angeles, Cal.: Smith Bridge Co., Toledo, O., No. 1, \$59,800; No. 2, \$46,900; No. 3, \$41,700; No. 4, \$53,200; No. 5, \$43,000; No. 6, \$37,890. California Bridge Co., San Francisco, No. 1, \$57,640; No. 2, \$39,675; No. 3, \$43,000; No. 4, \$49,480; No. 5, \$40,270; No. 6, \$36,974. San Francisco Contracting Co., San Francisco, No. 1, \$70,000; No. 2, \$53,440; No. 3, \$41,500; No. 4, \$55,785. San Francisco Bridge Co., No. 1, \$54,000; No. 2, \$46,300; No. 3, \$41,000; No. 4, \$37,500.

Bids will be received by the Supervisors of Mendocino County, Cal., till Oct. 14, for erecting a bridge across Navarro River, at Cuffey's Cove.

The Elgin, Joliet & Eastern has constructed a trestle one mile long over the Desplains River, Illinois & Michigan Canal and the Chicago, Santa Fe & California and Chicago, Burlington & Quincy railroads at Joliet, Ill. The spans at the crossings are iron truss bridges.

Manufacturing and Business.

McArthur Bros., of Chicago, have been awarded the contract to construct the St. Mary's Falls Water Power Canal at Sault Ste. Marie.

The Consolidated Safety Valve Co., Bridgeport, Conn., recently elected the following officers: President and General Manager, Charles A. Moore; Treasurer and Secretary, Martin Luscomb; Superintendent, G. W. Richardson.

At a meeting of board of the directors of the Decatur Car-Wheel & Manufacturing Co. on July 28, the resignation of E. B. Tippet as Vice-President and General Manager was accepted. Until a successor has been appointed to Mr. Tippet the business of the company will be under the management of the Secretary and Treasurer, R. L. McCulloch.

The new iron foundry of the Chapman Valve Manufacturing Co. at Indian Orchard, Mass., is now nearly completed, and will soon be occupied. The company has 200 hands constantly employed on full time.

The following proposals for furnishing pumping machinery

for the water works in Sacramento, Cal., were opened July 23: H. P. Gregory & Co., San Francisco, Blake's pump, \$47,500; S. T. Flagler & Co., Lockport, N. Y., Gaskill pump, No. 7, \$38,000, No. 6, \$30,000; Parke & Lacy, of San Francisco, Knowles pump, \$40,000; A. L. Fish, San Francisco, Worthington pump, \$58,100; another style for \$58,500 additional, and still another style for \$41,000.

The Southern Construction & Development Co. has been organized at Water Valley, Miss., by F. M. Abbott, J. H. Brinker and R. C. Becker.

The San Diego Construction Co. has been organized at San Diego, Cal., with a subscribed capital stock of \$100,000 by W. S. Waterman, T. J. Daley, W. G. Rifenburg, F. T. Hill, to construct railroad, telephone, street car and steam motor lines and bridges in the state of California and in the Republic of Mexico.

In our issue of Aug. 3 we stated that the Texas & Pacific had ordered a large number of Sheffield paper wheel hand-cars. This was a mistake, as the Kalamazoo Railroad Velocipede & Car Co., of Kalamazoo, Mich., is the only manufacturer of a paper hand car wheel. The Texas & Pacific is using the Kalamazoo combination paper and wood plate wheel hand-cars exclusively, and has purchased several car loads within the last few months. These cars are meeting with good success, and enough orders have been received for them to keep the company busy for the next three months.

The following are some of the roads using them exclusively: Missouri Pacific, New York Central & Hudson River, St. Louis & San Francisco, Texas & Pacific, San Antonio & Arkansas Pass, St. Paul, Minneapolis & Manitoba, Mexican National, Louisville Southern, Florida Southern, Oregon & Washington Ter., and Cleveland & Canton.

The Marion Steam Shovel Co., of Marion, O., manufacturers of Barnhart's Steam Shovel and Wrecking Car, have established an agency on the Pacific Coast for their machinery, and Geo. W. Barnhart has been appointed their representative there, with office at Room 63, Flood Building, San Francisco, Cal.

Iron and Steel.

The Lac'de Plate & Sheet Mills Co.'s mills will, it is said, be closed this week permanently.

Joseph Clarkson & Son are erecting a four story building, 56 by 100 ft., on North Front street, Baltimore, to be used as a machine shop for the manufacture of wood-working machinery.

The new coke-ovens of the Sloss Iron & Steel Co., at Coalburg, Ala., are nearly all completed. Of the 63 that are being constructed, forty are entirely finished, and the remaining 23 will be completed in a few days.

The Nova Scotia Steel Co., of New Glasgow, N. S., will be reorganized as the Nova Scotia Steel & Forge Co. (Limited) with an increase of capital stock from \$300,000 to \$1,000,000, to enable the company to increase its facilities for the manufacture of steel and iron.

The Oakland Iron Works have been incorporated in California to manufacture machinery, milling supplies and foundry work of all kinds. The directors are George Cottrell, T. L. Armstrong, Edward Clark and others. The company has a capital stock of \$50,000.

J. P. Witherow, the well-known engineer of Pittsburgh, Pa., has about closed the contract for the erection of a large steel and iron plant at Sabinos, Mex. The plant will consist of two blast furnaces, a Bessemer rail and nail rod-mill, and structural iron works. Sabinos is in the heart of a coal and iron ore country, and is about equally distant from the towns of Eagle Pass and El Paso. The entire structure will be made of iron, and will be shipped ready for building from Pittsburgh. Eugene Kelly, of New York, is a large stockholder; Patricio Milmo, of the City of Mexico, is also largely interested.

Capt. William R. Jones, Superintendent of the Edgar Thomson Steel Works, has invented a metal mixer for mixing the iron as it comes from the furnaces, thus securing iron of a uniform quality for use in the steel converter. The machine is 15 x 9 x 5½ ft., is made of steel, brick and fire-clay and was three months in building. It is being used at the works.

A company, organized with the following officers, President, Clarence Richards; Vice-President, Carl Von Bronk; Treasurer, Edward Records; Expert, H. M. Ryan, all of Los Angeles, Cal., has purchased 2,000 acres of ore land in Iron County, Utah, and is arranging plans for furnaces and a rolling mill near Iron Springs. The company will erect two furnaces of 80 tons each, also with puddling furnaces and rolling mill. The specialty of manufacture will be heavy iron pipe of all kinds and steel rails. Arrangements are now making for the purchase of machinery and other necessary supplies. Building will begin in from five to seven weeks. The works are expected to be in operation by next June, and when they are running to the intended full capacity 1,600 men will be employed.

Col. James Colford, of Colford & McKee, of Pittsburgh, and John J. Spearman, of Sharon, Pa., have leased the Sharon furnace, of Boyce, Rawle & Co., at that place, and will put it in repair with the intention of early resumption. The furnace has been idle nearly a year.

The Jackson Furnace Co., of Jackson, O., has increased its capital stock from \$25,000 to \$40,000, and it is expected they will be making iron in a short time. Mr. John Bird, from the Low Moor Furnace, in Virginia, and former manager of the Sarah Furnace, of Ironton, O., will have charge of the furnace.

The Bessemer Iron & Steel Co. has been organized at Bessemer, Ala., by H. F. De Bardeleben, of Birmingham, and others, with a capital stock of \$1,500,000. Two coke furnaces, with a daily capacity of 125 tons each, will be erected. The company hopes to be able to make Bessemer steel.

The Little Bell Iron Co. has also been organized at Bessemer, and will build a 60-ton charcoal furnace for making car wheel iron.

The Cartersville Iron & Steel Co., has been organized at Cartersville, Ga., and it is stated will erect a large furnace at Cartersville and that the plans and specifications of the furnace are drawn up and ready for bids. The company have contracted with the Pratt Steel Co., of Birmingham, Ala., for the use of their process for dephosphorizing iron in the blast furnace.

Steel Cast Shells.

The Pittsburgh Steel Casting Co. has a government order for 500 hundred-pound shells cast from steel. The shell which the company is now casting is 6 in. diameter at the base and 2¼ in. long.

The Rail Market.

Steel Rails.—The market remains dull and no large sales are reported. Prices remain \$29 at eastern mills. A meeting was held at Long Branch Aug. 3, at which the present arrangement among the mills was continued for another year. The allotment was fixed at the same figure at which it was started a year ago, and other features of the agreement were continued, the principal changes being modifications in the percentages of the different mills.

Old Rails.—Sales of 5,000 tons have been made during the

week at private terms. Quotations for Am. tees, \$21 on barge.

Track Fastenings.—Quotations: Spikes, 2.05@2.10c. delivered; angle bars, 1.90c. for iron and 2.20c. for steel.

Okonite.

Okonite is a rubber composition which during the last four years has been extensively used as an insulating covering for electric wires. The composition is wrapped round the conductor in long strips closed with a longitudinal seam. It is claimed that the insulation is practically perfect both for high and low potentials, and that it will stand rough handling and a considerable temperature without injury. It is stated to be especially suitable for general telegraph work and for electric light purposes.

THE SCRAP HEAP.

Indiana Railroads.

The report of the State Board of Equalization has just been issued. "It shows," says an Indianapolis paper, "that despite the desperate efforts of the railroad attorneys to prove the utter worthlessness of the roads the board has decided that the total valuation is \$2,119,278 in excess of last year." There has been very little railroad building in the state during the last year, the total number of miles of main track this year being 5,745.75 as against 5,679.55 last year. The miles of second main tracks and side tracks has increased from 1,236 to 1,344.

The summary of the valuations of this year as compared with last is as follows:

	1888.	1887.
Main track.....	\$46,181,029	\$45,156,493
Second main track.....	924,990	549,470
Side track.....	2,968,608	2,685,677
Rolling stock.....	12,527,536	12,104,255
Improvements.....	1,609,554	1,586,544
Total	\$64,211,717	\$62,092,439

An English Accident.

A London dispatch of Aug. 7 says: There was a fatal collision at the Hampton Wick depot [London & Southwestern] at midnight last night, between a passenger train and a freight train. The locomotive and guard's van of the goods train mounted up over the locomotive of the passenger train and landed on the foremost passenger car. Two of the passenger cars were telescoped. The engineer and fireman of the passenger train and four passengers were killed.

High Speed.

Recently officers of the Sunbury & Lewistown found it necessary to catch a train on the Pennsylvania at Lewisburg Junction. The distance from Sunbury to the Junction is 44 miles, and the distance to be made in 47 minutes. General Superintendent Philips mounted the engine himself and ran the train to the Junction in 46 minutes.

More High Speed.

As an illustration of the speed at which railroad traveling can be effected when the necessity arises, it may be mentioned that last week an American having missed his train in London, and having to catch an Atlantic steamer at Liverpool, proceeded by the ordinary train to Crewe, where a special engine had been chartered to convey him direct to Liverpool. The distance between Crewe and Liverpool is 33 miles, and one of the large Crewe engines completed the journey in 33 minutes, the American reaching the landing stage at Liverpool 10 minutes before the timed departure of his steamer. The cost for this special service was £11 (\$53.57).—London Engineer.

Two Ways of Securing Traffic.

Commissioner Pierson, in an address before the recent meeting of General Passenger Agents at Cresson Springs, Pa., explained the philosophy of some passenger agents' methods thus:

"The tendency to pay commissions is undoubtedly constant and inherent. Indolent passenger men find it easier to buy business with somebody else's money than to make their line popular by personal attention to the requirements of the public. Lines which do not offer the public equal facilities with their competitors, who do not have lines of through cars, or who fail to make good connections, or for any other reason cannot easily command the patronage of the public, can always pick up some business by paying a large bonus to ticket sellers to send the unwary, the ignorant or careless, by their line."

A New Pacific Steamer Launched.

The steel steamship "Corona," built for the Oregon Improvement Co., of California, was successfully launched on Aug. 4, from the shipyards of Neffle & Levy, at Philadelphia. The vessel is built entirely of steel, is 236 ft. in length, 36 ft. beam, and 23 ft. 6 in. depth of hold. She is schooner-rigged, and will accommodate 200 first-class passengers. She will be taken to San Francisco as soon as her machinery is placed.

New Mileage in Texas.

From the statements furnished to the State Comptroller of Texas, it appears that for the year ending June 1, an aggregate of 916 miles of railroad has been constructed by the following companies: St. Louis, Arkansas & Texas, 317 miles; San Antonio & Aransas Pass, 238; Missouri, Kansas & Texas, 142; Fort Worth & Denver, 114; Gulf, Colorado & Santa Fe, 65; and Fort Worth & Rio Grande, 40. The total number of miles of railway in the state on June 1, 1888, was 7,590 miles.

Big Freight Bills.

A shipment of wheels and casting for trucks for a lot of freight cars for the Portland & Willamette Valley road recently ordered from the east cost \$12,000, and the freight on them amounted to \$10,000. A passenger car for the Alwaco & Shoalwater Bay road cost \$1,500, and the freight on it was \$768.

The Air Ship "Eli."

The air ship "Eli," invented and built from models by Colonel Joe White, of the Georgia road, lately left Atlanta on its way to Chattanooga, where a trial trip will be made from the Spiritualists' camp ground on Lookout Mountain. Several railroad men are to have seats in the "Eli" on its first trip, and one or two newspaper men will probably accompany them. Our editorial heart is divided between the "railroad men" and the "newspaper men" who thus tempt fate. We are sorry to spare either.

Notes.

The Southern Pacific Co. has ordered a buffet equipment for its service between Los Angeles and San Francisco. This

will be the first service of the kind on the Pacific Coast, except the Missouri Pacific line between St. Louis and San Francisco.

Thomas Campbell, a porter at the Manson House, Albany, N. Y., has been arrested for supplying ticket scalpers with tickets which had been stolen from the Albany Day Line steamers by two baggage masters employed on that line. The baggage masters, H. C. Partridge and W. F. Link, were also arrested.

The passenger engines on the Chicago, Burlington & Quincy now run through between Galesburg and Chicago, 163 miles. A Galesburg dispatch says that this arrangement was made at the request of the men. Hitherto the runs have extended from Chicago to Aurora, 38 miles, and Aurora to Galesburg, 125 miles. The new run will enable the new men to have their residence away from Aurora, in which place public sentiment continues bitter against them.

Fast Runs.

The Chicago & Alton recently hauled a train of 41 cars of live stock from Bloomington to Chicago in 3 hours 15 minutes, an average of about 40 miles an hour.

The Central of Georgia has made a freight schedule between Birmingham, Ala., and Savannah, providing for the running of trains through in 29 hours.

A tea train of 16 cars arrived in New York last week in a little less than 7 days from Tacoma, W. T., via the Northern Pacific, Chicago, Burlington & Northern, Chicago & Atlantic and Erie. The run over the Erie is said to have been made at the rate of 40 miles an hour.

An Endless Railroad Train.

Amongst the attractions of the forthcoming exhibition at Paris will be a veritable "Belt Line" of railroad, by means of which visitors will be enabled to make a tour of the exhibition grounds in the Champ-de-Mars without fatigue. The endless train will consist of 400 platform cars somewhat similar to those used for freight, the line being sunk so that the floor of the cars will be exactly level with the ground. The train will be run at a sufficiently slow speed to enable most people to get on and off whilst it is in motion, but to enable elderly people, females and children to mount, descend, or pass over the moving platform, there will be stoppages of fifteen seconds every minute. The motive power will be electricity.

Natural Gas at Cleveland, Ohio.

The Iron Trade Review announces with some satisfaction that a "spouter" has been struck between the tracks of the Cleveland & Pittsburgh and the Cleveland & Canton railroads at a depth of about 1,800 ft. At the time of the writing the well had been spouting gas and water with a pressure variously estimated at from 400 to 700 pounds since the Saturday before, with no visible diminution of quantity. The well is within a mile or two of both the Cleveland Rolling Mill and the Union Rolling Mill, as well as other larger companies works. As the Review says, this means a great deal for Cleveland, if the supply holds out, and as three more wells will be immediately sunk in proximity to the spouter, the supply will be tested. Incidentally this is another instance of the perils which beset prophets, as Cleveland had been condemned to barrenness, as far as natural gas goes, by all of the "experts."

Valuable Pasteboard.

Ticket Agent Thayer, of the Pennsylvania, in Cincinnati, recently sold to Mr. W. H. Doane and family round trip tickets to Sitka, Alaska, via Chicago, St. Paul, Tacoma, the National Park and steamer. There were five in the party, and the amount paid was over \$1,000. "This beats the record," says an exchange.

At the rate allowed between Chicago and St. Paul the agent's commission would enable him to visit Coney Island for a whole day.

A Big Gas Well.

The new roaring gas well of the Philadelphia Company, near Canonsburg, Pa., is said, according to the registered pressure, to be the largest well in the world. The gas looks like a solid piece of blue steel for some distance after it comes out of the pipe. Solid masonry, 13 ft. thick, was put in around the top of the well to hold the cap on. The tools and rope thrown out were, perhaps, the heaviest of any yet moved in that way. The iron in the tools weighed 3,000 lbs. The wet rope, nearly 2,000 ft. long, weighed as much more, but was thrown up like a rocket, the rope coiling around the ruins of the derrick like so much yarn.

A Big Rebate—If They Get It.

In accordance with the decision of the Inter-state Commerce Commission, Messrs. Holdship & Irwin have entered suit at Pittsburgh, Pa., against the Pennsylvania road for damages for alleged discrimination in rates and facilities. The firm assert that they shipped from Pittsburgh to Philadelphia 90,044 barrels of refined oil in 1884, 100,353 barrels in 1885, and 71,174 barrels in 1886, a total of 261,571 barrels. They allege that a rebate of thirteen cents a barrel was allowed a competitor, and claim triple damages as allowed by the statute, which would amount to \$102,012. They allege further damage in discrimination in the matter of cars, and sue for \$150,000 to cover all damages.

New Buildings in Sheffield.

At a meeting in Sheffield, Ala., last week of representatives of the Sheffield & Birmingham Coal, Iron & R. R., the Memphis & Charleston, and the Nashville, Florence & Sheffield, it was decided to build a Union Depot in the city immediately. Work will also soon be commenced on the shops of the Memphis & Charleston and the Nashville, Florence & Sheffield. The shops and roundhouse of the Sheffield & Birmingham will be completed in a short while.

A Scrap Torn from Current History.

General Passenger Agent Charlton, of the Chicago & Alton, celebrates some recent events by the issuance of this circular, "after Ossian," which he scatters broadcast to ticket agents:

"Then the gallant Lord of Baltimore, always foremost in the fray, having borne himself bravely in the fight, left the field scorning longer to combat with such allies in such a cause. He, of fair Cleveland, that overlooks the sea, had already left his faithless allies, who had left him to bear the brunt of the fight. The clans scattered to the seashore and to the Alleghenies and found no comfort in counsel. Then the dark chief of Blanchland, his raven locks tossing wildly to the wind, his voice fierce with rage at his defeat, his words loud and angry as the torrent in storm strode forward and cried:

"Who has done this? Where are the boycotters? Who has slain or abducted them, or turned them from their allegiance?"

"And the Alton, calm as fate, soft as a mellow peach, cool

as a cucumber and voracious as the father of his country, answered and said:

"I cannot tell a lie; I did it with my little hatchet."

"When the chief heard this he bowed his crested head and fell prone to the ground, and the curtain fell to slow music; and on that day the ticket agents lifted up their voices and sang this song:

"Sound the loud timbrel o'er Penny's dark sea.
The Alton has triumphed; the agents are free.
Sound the loud timbrel o'er Penny's dark sea.
The boycott is lifted; the agents are free."

Fireman and Tender Unnecessary.

A wonderful new engine has made its appearance in the deserted marble halls of Zenobia, the whilom Queen of the East. The tractive power of the new locomotive is so great that it has actually hauled two loaded freight cars. The inevitable "well known expert" has, of course, been interviewed on the subject and has recorded his views with all the refreshing vigor and unsuspecting confidence of one who, in the words of the Minneapolis poet, "is 26 years of age, has graduated at Heidelberg and can say 'hot Scotch' in French with an American accent."

One great feature of the invention is that an empty quart bottle placed on the floor of the engine remains undisturbed. What becomes of a full bottle is not stated, and in this omission the expert shows a lack of practical knowledge. However, the fact that a glass filled to the brim with water is also unaffected by the sight of this tremendous invention somewhat redeems the expert's reputation.

The expert having wisely let the water and the empty bottle alone testifies:

"I saw also that you heated the air used for combustion with heat from the exhaust steam, which by other systems is thrown away and wasted; and that you saturated or mixed with this heated air the exhaust steam, and thereby more than doubled its capacity for supporting combustion; and that you had another advantage, for you extracted the oxygen from the steam, and passed the liberated hydrogen up through the incandescent fuel in the fire-box, and also admitted it in small jets above this heated fuel in the fire-box and made this hydrogen, which is a powerful combustible, available as a heating medium, as it came in contact with the heated air; and all the carbon particles it could seize were consumed with it; and this was done under such conditions, and in such quantities, and at so low a pressure, and safe temperature, as to be without harmful effects to the iron, or on account of its explosive quality, results never attained before, to my knowledge."

The expert's powers of vision, however, are especially strong as to what he did not see, for he continues:

"After riding for several hours on the new locomotive, seeing no waste of steam, fuel or carbon particles passing away in smoke, seeing no stoking done at any time, no water tank or tender, and feeling no jar or jerking motion, but moving like a boat in the water, starting and stopping with ease, bearing no noise, except of wheels on the iron rails; I must say that I have looked upon the most novel and useful invention of modern times, in my judgment, for the purposes for which it was constructed."

Feeling, perhaps, that a locomotive which will run without fuel or water is a marked improvement upon perpetual motion, our expert scarcely keeps up to the same high level and loses his grip: "but I still have my fears that any statement made, or description given, might not be accepted or believed."

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Alton, quarterly 2 per cent. on the preferred and common stock, payable Sept. 1, to stockholders of record Aug. 15.

Chicago & Eastern Illinois, quarterly, 1/2 per cent. on the preferred stock, payable Aug. 25.

Chicago & Indiana Coal, quarterly, 1/2 per cent. on the preferred stock, payable Aug. 25.

Chicago & West Michigan, 1 per cent., payable Aug. 15, to stockholders of record Aug. 4.

Kansas City, Fort Scott & Memphis, 4 per cent. upon the preferred stock of the Kansas City, Fort Scott & Gulf, and Kansas City, Fort Scott & Memphis Railroad Companies, and 1 per cent. upon the common stock of the latter company, will be paid Aug. 15, 1888, to stockholders of record Aug. 4.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Boston, Hoosac Tunnel & Western, annual meeting, Saratoga Springs, N. Y., Aug. 15.

Chicago & Atlantic, annual meeting, Huntington, Ind., Sept. 6.

Northwest & Florida, special meeting, Montgomery, Ala., Aug. 30.

Selma & Cahaba Valley, special meeting, Selma, Ala., Aug. 27.

Troy, Saratoga & Northern, annual meeting, Saratoga Springs, N. Y., Aug. 15.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Roadmasters' Association of America will hold its sixth annual convention at the Metropolitan Hotel, in Washington, D. C., commencing at 9 a. m., Tuesday, Sept. 11, and continuing in session three days.

The New England Roadmasters' Association will hold its sixth annual convention at the United States Hotel, in Boston, Mass., Aug. 15-16.

The National Association of General Passenger and Ticket Agents will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The American Society of Mechanical Engineers will hold its eighteenth convention and ninth annual meeting in Scranton, Pa., beginning Monday evening, Oct. 15.

The Association of North American Railroad Superintendents will hold its next meeting at the Southern Hotel, St. Louis, beginning Sept. 19.

The Master Car and Locomotive Painters' Association will hold its nineteenth annual convention at the Hollenden Hotel, in Cleveland, O., commencing Sept. 12, at 10 o'clock a. m.

The American Institute of Mining Engineers will hold its fifty-second meeting at Buffalo, N. Y., beginning on Tuesday evening, Oct. 2, 1888.

The American Association for the Advancement of Science will hold its thirty-seventh meeting in Cleveland, O., Aug. 15 to 21. The headquarters will be at the Hollenden Hotel.

The American Association of Railway Chemists will hold its next meeting in Baltimore, Md., in October.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* will hold its next meeting on the third Wednesday in September, at the Grand Pacific Hotel in Chicago.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its next regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of September.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Club of Philadelphia* will hold its next meeting in Philadelphia, Oct. 6.

The *Engineers' Society of Western Pennsylvania* will hold its next meeting at Pittsburgh, Sept. 18.

The *Engineers' Club of Kansas City* will hold its next regular meeting Sept. 3.

American Society of Civil Engineers.

The following circular is issued:

The Board of Direction of the American Society of Civil Engineers invites professional papers and communications on subjects of engineering interest from all persons, whether members of this Society or not. These papers and communications will be accepted for publication in the Transactions of the Society, subject to the regular rules prescribed by the Society laws in regard to its publications. These rules provide for a proper editorial supervision, and for the exclusion of old matter readily found elsewhere, of matter specially intended to advocate personal interests, of matter carelessly prepared or controverting established facts, and of matter purely speculative or foreign to the purposes of the Society. Discussion is also invited from all persons interested in the papers presented to the Society, such discussion to be, of course, subject to the same editorial rules.

The Transactions of the Society will be sent to any subscriber at the rate of \$10 per year, and to clubs of ten or more, when ordered through the secretary of an engineering or technical society or club, who will be responsible for the payment, at 25 per cent. discount.

Road Masters' Association of America.

The following circular is issued from the office of the president:

The sixth annual meeting of the association will be convened at the Metropolitan Hotel, Washington, D. C., for three days' session, at 9 o'clock a. m., Tuesday, Wednesday and Thursday, Sept. 11, 12 and 13, 1888.

The Committee appointed to prepare a programme of questions for discussion at this meeting, have submitted the following:

- 1st. Standard Track Joints.
- 2d. Standard Hand Cars.
- 3d. Snow and Snow Plows.
- 4th. Specifications for Cross Ties.
- 5th. Labor on Track; Labor required under varying conditions.

Arrangements are now in progress to secure free transportation for all delegates (and their wives) who hold proper certificates issued by the association. All who can meet with us will please notify the secretary of their intention to do so, and he will furnish delegates with certificates, should the several railroad managements consent to honor them in lieu of a pass. Should we be denied this mode of transportation, you will be promptly notified, that each one may make other arrangements for passes. Arrangements have been made for special rates (\$2.50 per day at the Metropolitan Hotel). Delegates' certificates will only be sent when applied for.

Engineers' Club of Kansas City.

On July 28 the club made an excursion to Leavenworth. Twenty-seven members and 42 guests visited the Soldiers' Home at Fort Leavenworth, and other points of interest in that region, and were pleasantly entertained by local engineers.

PERSONAL.

—Mr. Frank Thomson, First Vice-President of the Pennsylvania, sailed for Europe on the "Etruria" on Aug. 5.

—Mr. George E. Smith, Assistant General Freight Agent of the Minneapolis & St. Louis, has resigned on account of failing health, and is succeeded by W. M. Hopkins.

—Mr. George A. Cartwright has resigned his position as General Freight Agent of the Colorado Midland to accept a position with the Atchison, Topeka & Santa Fe, with headquarters on the Pacific Coast.

—Mr. Isaac P. Madden, of the Madden & Cockayne File Works, of Middletown, N. Y., and Secretary and Treasurer of the Middletown & Crawford Railroad, a leased line of the New York, Lake Erie & Western, died Aug. 7 of apoplexy. He was 52 years of age.

—Mr. Benjamin Thomas, formerly for several years General Superintendent of the New York, Lake Erie & Western, and at present General Superintendent of the Chicago & Atlantic, was this week elected Vice-President and General Manager of the Chicago & Western Indiana and the Belt Railway of Chicago, to succeed James D. Carson, resigned.

—Mr. William Norris, a grandson of the early locomotive builder of that name, has recently started in the railroad and mining supply business in Kansas City. Mr. Norris is a practical engineer of much experience, gained in this country and in Brazil, etc., and it may be anticipated that he will fully maintain the family reputation.

—Mr. Jacob French Sharp, one of the founders of the Delaware Car Works at Wilmington, Del., died in that city on Aug. 2, aged 73 years. He was born in Hunterdon County, N. J., became a bridge builder, was employed on several important railroad structures, and finally, in 1840, began car building in Wilmington, being a partner in what is now the Jackson & Sharp Co. He retired from active business in 1870.

—D. B. Robinson, General Manager of the Colorado Midland, has tendered his resignation, to take effect Aug. 15. It is understood that he will accept an important position with an Eastern company. Mr. Robinson has been General Man-

ager of the Colorado Midland since almost the beginning of its construction, and has virtually built, equipped and put in operation the first standard gauge railroad to the Rocky Mountains of Colorado. Mr. Robinson was born in Vermont in 1847, and in 1866 entered the service of the Central Vermont. He has been General Manager of the Sonora Railroad, and Division Superintendent and General Manager of the Mexican Central. In September, 1885, he was appointed General Manager of the Atlantic & Pacific, and in November, 1886, to his present position.

—Mr. H. Collbran retires from the position of General Freight and Passenger Agent of the Cincinnati, New Orleans & Texas Pacific to become Traffic Manager of the Colorado Midland. He has occupied the former position three years, during which time the earnings of the "Queen and Crescent" system have been increased greatly. The following is a list of the appointments held by him since 1881: General Freight and Passenger Agent of the Alabama Great Southern, August, 1881; General Freight and Passenger Agent of the Alabama Great Southern Railroad and the New Orleans & Northeastern, June, 1882; General Freight Agent of the Cincinnati, New Orleans & Texas Pacific and associate roads (Queen and Crescent System), January, 1884; General Freight and Passenger Agent of the Queen and Crescent system, July, 1885.

—Sir George Stephen resigned the Presidency of the Canadian Pacific this week at the monthly meeting of the board, and Mr. W. C. Van Horne, Vice-President and General Manager, was elected to fill the vacancy. Sir George will reside permanently in England, and will act as Chairman of the Financial Committee there. He still remains a member of the board, and is still the second largest shareholder. In a circular to the shareholders, Sir George states that from the time he became a party to the contract with the Dominion Government he has only awaited a favorable opportunity to relinquish a active control of the road.

He congratulates the shareholders upon the arrangements recently completed by Sir Donald Smith and himself with the Minneapolis, St. Paul & Sault Ste. Marie by which the Canadian Pacific secures a traffic the importance of which it would be difficult to overestimate. He also congratulates them that arrangements have been settled with the Wabash for a permanent connection between the Detroit River and Chicago and the Southwest; and further that the long-pending negotiations with the Imperial Government for the establishment of a first-class steamship line between Vancouver and Japan and China have at last been concluded.

ELECTIONS AND APPOINTMENTS.

Brooklyn, Bath & West End.—T. Dickerson has been appointed Master Mechanic to succeed Augustus Wolf, resigned.

California Southern and California Central.—Mr. John R. Gott having resigned the position of Assistant Superintendent of these companies, the office has been discontinued until further notice. Mr. George W. Sanborn has been appointed Superintendent of these companies, with office at San Bernardino. He will have control of all matters relating to transportation, including the mechanical and maintenance of way departments, and will report to the General Manager.

Canadian Pacific.—Sir George Stephen resigned the Presidency of the road this week at the monthly meeting of the board, and Vice-President and General Manager N. C. Van Horne was elected to succeed him. The resignation of Levi P. Morton, of New York, as a director was also accepted, and Senator Donald McInnes, of Hamilton, Ont., elected in his stead.

Chautauqua Lake.—The first annual meeting was held in Chautauqua, N. Y., Aug. 7, and the following officers and directors were elected: President, Joseph M. Gazzam, Philadelphia; Vice-President, J. C. Williams, Cleveland; Treasurer, George H. Burt, Boston; Secretary, Daniel H. Post, Jamestown, N. Y.; General Superintendent, T. G. Jewett, Jamestown; Auditor and Assistant Treasurer, Frederick Bristow, Jamestown. Directors: J. M. Gazzam, C. E. Jones, F. E. Gifford, A. N. Broadhead, Willie Tew, John Caldwell, E. L. Hall, E. A. Sherman, R. G. Wright, A. B. Brewer, J. C. Williams, W. Barnum and E. B. Phillips.

Chattanooga, Rome & Columbus.—W. B. Starke has been appointed Auditor of this and the Rome Railroad, with headquarters at Rome, Ga., to succeed J. T. Slatter, transferred.

Chicago, Kansas & Nebraska.—W. J. Lawrence has been appointed Superintendent of the Western Division, comprising that part of the line in operation west of Phillipsburgh, Kan., with headquarters at Goodland, Kan.

Cincinnati, Indianapolis, St. Louis & Chicago.—E. A. Hill, Chief Engineer of the Indianapolis, Decatur & Springfield, has been appointed Real Estate Agent, succeeding Thomas Barbour, who was a short time ago appointed Auditor of the Chesapeake & Ohio.

Cincinnati, New Orleans & Texas Pacific.—The following circular has been issued: Mr. H. Collbran having resigned the position of General Freight and Passenger Agent of this system of roads, taking effect Aug. 11, the following appointments have been made: R. X. Ryan, General Freight Agent; G. P. Biles, Assistant General Freight Agent; T. F. Steele, Division Freight Agent; A. F. Barnett, Division Freight Agent, and D. G. Edwards, Acting General Passenger Agent. The appointments to take effect Aug. 12.

Colorado Midland.—H. Collbran has been appointed Traffic Manager, with headquarters at Denver, Col., appointment to take effect Aug. 11.

T. R. Gabel having resigned to enter the service of another company, C. N. Davids has been appointed Material Agent, with headquarters at Colorado City, the appointment to take effect Aug. 15.

Coronado.—George W. Howard has been appointed General Superintendent, with headquarters in San Diego, Cal.

Covington & Macon.—J. C. Key has been elected Vice-President to succeed the late B. W. Probel.

Downington & Lancaster.—The stockholders of the company, which is a reorganization of the East Brandywine & Waynesburg, have chosen the following officers: J. N. Du Barry, Henry D. Welsh, N. Parker Shortridge, John P. Green, William A. Patton, George Kugler and Samuel Rea, directors; J. N. Du Barry, President, and Albert Rawson, Secretary and Treasurer.

Duluth, South Shore & Atlantic.—The following directors were chosen at a meeting held in New York last week: Representing the new ownership—Sir George Stephen, Sir Donald A. Smith, W. C. Van Horne, J. W. Stirling, Thomas W.

Pearsall and R. J. Cross. Representing the old management—Samuel Thomas, C. S. Brice, George I. Seney, John G. Moore and James McMillan. The directors organized by electing the following officers: President, James McMillan; First Vice-President, C. S. Brice; Second Vice-President, W. C. Van Horne; Treasurer, W. H. C. Ewen, and Secretary, L. M. Schwan. Mr. McMillan was elected President, and Mr. Brice Vice-President, of the Marquette, Houghton & Ontonagon and the Marquette & Western.

East Tennessee, Virginia & Georgia.—T. A. Phillips has been appointed Superintendent of Transportation of the roads of this system, with headquarters at Knoxville, Tenn.

Interoceanic.—The following are the directors and officers of the company: Directors: A. B. Forwood, Esq., M. P., Chairman; The Right Hon. Earl De Grey, 12 Bruton street, London, W.; G. E. Paget, A. R. Robertson, Don Carlos Calderon; Solicitors, Ashurst, Morris, Crisp & Co., 6 Old Jewry, London, E. C.; Engineers, James Livesey & Son, 2 Victoria Mansions, Westminster, London, S. W.; Auditors, Duncan, Bryce & Co., 41 Coleman street, London, E. C.; Secretary, G. W. Hoghton. The offices of the company are at Dashwood House, 9 New Broad street, London, E. C.

Kansas City & Pacific.—Charles W. McFarlan has been appointed Master Mechanic.

Lake Shore & Michigan Southern.—H. C. Clement has been appointed Master of Transportation of the lines west of Toledo, O.

Lake Superior Terminal & Transfer Railway Co.—F. B. Eldred has been appointed Superintendent, with office at West Superior, Wis.

Leavenworth & Rio Grande.—The first board of directors of this Kansas company is as follows: C. C. Burnes and D. D. Burnes of St. Joseph, and E. C. Post, Frank Howard and H. R. Bostwick of Atchison.

Louisville Southern.—J. H. Pearson has been appointed Engineer of the Georgetown extension.

Mount Pleasant & Seaview City.—The following are the officers of the road: R. C. Gilchrist, President; W. P. Fleming, Secretary and Treasurer; S. Lewis Simons, Chief Engineer; John Bradley, Superintendent. The general office of the company is at Charleston, S. C.

Ohio Valley Railway & Terminal Co.—The first board of directors of this short Indiana road are as follows: Charles Viele, John Ingle, M. J. Bray, Jr., Jordan Giles, R. H. Ingram, J. B. Montgomery and J. F. Clay.

Pennsylvania, Poughkeepsie & Boston.—The officers of the company are: John I. Platt, President; George W. Greene, Vice-President; W. R. Carlie, Treasurer; David J. McNiece, Secretary; directors, H. H. Boody, E. E. Chapman, Ezra White, Peter Hulme, J. C. Stanton, C. H. Swan, P. K. Green, W. E. Cook and C. H. Demeritt.

Portage.—The incorporators of this company are: James McMillan, Hugh McMillan, W. C. McMillan, Joseph Taylor, Richard Rice, Safford S. Delano and Claude W. Case, all of Detroit, Mich. The majority of the stock is held by James McMillan.

Rutland.—The new board of directors met last week and organized by the re-election of the following officers: President, Percival W. Clement; Vice-President, Horace G. Young; Secretary, James Barrett; Treasurer, E. T. Smith.

St. Louis, Arkansas & Texas.—H. G. Fleming, in addition to his duties as General Superintendent, will hereafter perform the duties of Chief Engineer, vice J. F. Hinckley, resigned.

St. Louis, Keokuk & Northwestern.—W. E. Cunningham has been appointed Assistant Superintendent in addition to his duties on the Chicago, Burlington & Kansas City. His headquarters will be transferred from Moulton, Ia., to Keokuk. The trainmaster having been transferred to assist services the duties of the office will devolve upon the assistant superintendent.

St. Louis & Northwestern.—E. M. Collins, of Kirksville, Mo., has been appointed Chief Engineer.

Silvertown.—The first annual meeting of the company was held in Silvertown, Col. July 28. Otto Meers, Adair Wilson, John A. Porter, J. H. Ernest Waters, George Crawford, John W. Wingate and F. Watson were elected directors. The officers elected were: Otto Meers, President; John A. Porter, Vice-President; John W. Wingate, Secretary; F. Walsen, Treasurer; Adair Wilson, Solicitor, and C. W. Gibbs, Chief Engineer.

Texas & Pacific.—M. W. Elliott has been appointed Master Mechanic for the Eastern Division, with office at Marshall, Tex., vice George D. Brooke, resigned. His duties and jurisdiction will also extend to Boyce.

Texas Western.—S. Packer, previously Auditor and General Freight Agent, is now Receiver of this road, in place of Geo. C. Rives.

Toledo, Saginaw & Muskegon.—The following officers of the Detroit, Grand Haven & Milwaukee have had their authority extended over this road: W. J. Spicer, General Manager; George B. Reeve, Traffic Manager; James H. Muir, Secretary and Treasurer; George Masson, Chief Engineer; A. B. Atwater, Superintendent; H. Roberts, Mechanical Superintendent, and E. W. Meddough, Counsel. The headquarters of the company will be at Detroit.

Walbonding & Mohawk Valley.—John Mackey, E. B. Mackey, J. O. Crane and others are the incorporators of this Ohio company.

Western Maryland.—E. O. Vandevanter has been appointed Division Engineer of the Baltimore & Harrisburg Division.

OLD AND NEW ROADS.

New Companies Organized.—Bingaw & Onslow.—Cypress.—Downington & Lancaster.—Leavenworth & Rio Grande.—Memphis & Atlantic.—Middletown & Hummelstown.—Milledgeville & Asylum.—Minneapolis & St. Paul Rapid Transit.—Ohio Valley Railway & Terminal Co.—Portage.—Walbonding & Mohawk Valley.

Albert Southern.—About 140 men are now at work on the Alma end of this New Brunswick road, and work is being vigorously pushed.

Atlanta & Florida.—The road was opened this week to Fort Valley, Ga., 104 miles southwest of Atlanta and on the Central of Georgia.

Birmingham Mineral.—Grading on the Huntsville extension is progressing rapidly. Large forces of hands have just been placed at work on the 19 mile extension between Village Springs and Chepultepec, Ala., and it is expected to have this extension finished by Sept. 15.

Boston & Providence.—All of the 35 cases against the company arising out of the Bussey bridge accident, and which were placed in the hands of George F. Williams, have been settled without a trial. Two cases were referred to arbitrators, in one of which the plaintiff was awarded \$18,000. The highest amount received by any one injured in the accident was \$25,000. It is understood that the whole cost to the company was about \$1,000,000. The bills of physicians amounted to about \$100,000.

Buena Vista & Ellaville.—One hundred and eighty convicts arrived at Columbus last week to work on the extension from Buena Vista to Columbus, Ga., 38 miles. This makes 600 convicts at work on the line.

Burgaw & Onslow.—The company has been organized at Burgaw, N. C., to build a road from that place to Jacksonville, a distance of about 28 miles. The capital stock is \$300,000. George A. Ramsey of Burgaw, is one of the projectors.

Cairo & Northwestern.—The preliminary survey was completed last week from Cairo along the Mississippi River to East Cape, Girardeau, Ill., a distance of about 30 miles. The route will be an easy one to construct. It has not yet been decided when to call for contracts. M. Brown, Cairo, Ill., is Chief Engineer.

Canadian Pacific.—Tracklaying on the extension through Northern Maine has now been completed beyond Greenville for about 12 miles. About 600 men and 150 teams are at work on the line through Piscataquis County. At Wilson Stream, east of Greenville, work has begun on the iron viaduct which is to be 850 ft. long and 100 ft. high. Work on the viaduct at Ship Pond, which will be 1,350 ft. long and 120 ft. high, will begin in about two weeks.

The company will soon commence constructing an extension from London, Ont., to Detroit. Extensive dock property and terminals have been purchased at Windsor, opposite Detroit, between the Grand Trunk and Michigan Central docks. It is said that arrangements have also been perfected to parallel the Grand Trunk between Hamilton and Toronto.

Cape Fear & Yadkin Valley.—The locating survey for the extension to Wilmington, N. C., has been completed. As already noted, the first 30 miles from Fayetteville to the Black River, is under contract to W. F. Fortune.

Carolina, Cumberland Gap & Chicago.—On the 25 mile section between Aiken and Edgefield, S. C., tracklaying has been completed for about 15 miles. Surveys are still in progress from Pickens to Asheville, S. C.

Central of New Jersey.—This road is making extensive and important improvements on both its main and branch lines. The new draw on the trestle crossing Newark Bay, which we described and illustrated some time since, was one of the first changes made. Contracts for two new draws on the Newark branch, one of 212 ft. and the other of 172 ft., have been made with the New Jersey Steel & Iron Co. Contracts have also been made with Coffrode & Taylor for new bridges across the streets of Newark. New rails, weighing 76 lbs., have, to a large extent, been put down in place of those weighing 70. The old rails taken up have been used on the third track which is being laid between Communipaw and Roselle to accommodate the traffic of the Lehigh Valley Railroad. The second track on the Long Branch division, between Elizabethport and Perth Amboy, is nearly finished. A signal station is being put in at Elizabethport, where the Long Branch and Newark branches leave the main line. Another signal station will be placed at Roselle, where the Lehigh Valley joins the Central. The big passenger depot at Communipaw is rapidly assuming shape. All the piling has been driven, a good foundation having been found at all points. The walls of the train shed and the roof of the wings are up. The walls of the main structure, to be devoted to waiting-rooms, offices, etc., are up a sufficient distance to convey some idea of the general arrangement of the ground floor. The contemplated change in the slips has not yet been begun.

Charleston, Cincinnati & Chicago.—Tracklaying on the southern division, between the Catawba River and Blacks, S. C., 61 miles, which was suspended some time ago to await the completion of the bridge over the Catawba River, has now been resumed, and the track is expected to reach Yorkville by Sept. 20, and Blacks, S. C., by Nov. 1. That part of the Southern division from Camden to Rock Hill, 66 miles, will be opened for traffic by Aug. 10. The Rutherford division is already in operation from Blacks to Rutherfordton, N. C., 45 miles, and when the road from Rock Hill to Blacks is opened there will be a continuous line from Camden to Blacks of 146 miles. At Marion, Tenn., 20 miles from Rutherfordton, the road will connect with the Western North Carolina and at Johnson City, 87 miles further, with the East Tennessee, Virginia & Georgia. The road will be completed to these points next year. The objective point is Ashland, Ky., on the Ohio River.

Chattanooga, Rome & Columbus.—The directors have decided to soon commence the extension of the road from Carrollton, Ga., to Columbus, and thence probably to Montgomery, Ala.

Chesapeake & Ohio.—Judge Welford, of the Henrico County Circuit Court of Virginia, has continued until Sept. 1 the hearing of the motion for the appointment of a Receiver in place of the late Gen. W. C. Wickham. This continuance is done, it is understood, to allow the Reorganization Committee to complete the arrangements for taking the road out of the hands of the Court.

Chicago & Gulf.—It is stated that President C. C. Merrick, has organized a construction company in Chicago to build the road.

Chicago, Madison & Northern.—This new line of the Illinois Central was opened for business Aug. 6, and hereafter all Illinois Central traffic between Chicago and Freeport, Ill., and Madison, Wis., will pass over the new line.

Chowan & Southern.—Proposals are asked until Aug. 25 for constructing the northern division from Drivers, Va., near Norfolk, southwest 36 miles, to Tunis, N. C., on the Chowan River, and also the southern division, from Roxobel, on the Roanoke River, to Tarborough, N. C., a distance of 27 miles. The road is already constructed between Tunis and Roxobel. The work is light, except the approaches to the Chowan and Roanoke rivers. At Tarborough the road will connect with the Atlantic Coast Line, and when completed will give that and the Richmond & Danville systems a new connection with Norfolk. Address bids to G. M. Serpell, General Manager, 100 Main street, Norfolk, Va.

Cincinnati, Hamilton & Dayton.—The Common Pleas Court at Hamilton, Ohio, this week dissolved the temporary injunction to restrain the company from selling the stock of the Cincinnati, Richmond & Chicago.

Clarendon & Pittsford.—Tracklaying has now been completed on this road from Proctor to Centre Rutland, Vt., a distance of five miles. No definite arrangements have as

yet been made for building the line surveyed between West Rutland and Timmouthe, a distance of 15 miles. George C. Robinson, of Proctor, Vt., is Chief Engineer.

Clearfield & Jefferson.—The Cambria & Clearfield branch of this road has been completed, and trains will be run over it in a few days.

Coronado.—It is thought that work will soon begin on an extension of the road to Ensenado, Mex., a distance of about 70 miles, which has already been surveyed. A proposed extension to Yuma, Arizona, a distance of 185 miles, has also been surveyed.

Covington & Macon.—Tracklaying has been completed to within two miles of Watkinsville, Ga., but has been suspended owing to the non-arrival of the rails. A trestle is being constructed near the depot in Madison, Ga. The City Council of Athens, Ga., last week passed an ordinance granting the company the right of way through the streets of the city.

Cypress.—Organized in Florida by C. W. Hagerman, Frank Massey and F. B. Hagerman, to build a road from near Cypress to the Alabama state line.

Downingtown & Lancaster.—A charter has been granted this company, which is a reorganization of the East Brandywine & Waynesburg, extending from Downingtown to New Holland, Pa., 28 miles. The capital stock of the new company is \$250,000. A project is on foot to extend it from New Holland to Lancaster, the expectation being that through a connection with the main line of the Pennsylvania at Lancaster enough additional traffic could be secured to make the entire line a profitable one. At present the road does not pay. It is leased to the Pennsylvania.

Duluth, South Shore & Atlantic.—The extension of the road from Nestoria west to Iron River Junction, Mich., where it connects with the Northern Pacific, is now ballasted throughout and the construction forces are smoothing up the road preparatory to turning it over to the operating department.

East Brandywine & Waynesburg.—The company has been reorganized as the Downingtown & Lancaster.

Elgin, Joliet & Eastern.—The road has now been completed from Eola north to Spaulding, Ill., a distance of 16 miles. Eola is on the Chicago, Burlington & Quincy and near Aurora, and Spaulding is on the Chicago, Milwaukee & St. Paul and near Elgin, Ill. A line has also been completed from Joliet to Linden. From Aurora southeast to Joliet, 21 miles, a line is already in operation, and an extension is now being built from Joliet to Hobart, 50 miles. W. E. Dornen & Co., of Joliet, Ill., are the contractors. The Gardner, Coal City & Northern is also under construction from Plainfield to Gordon, 32 miles. The contractors are E. P. Reynolds & Co., of Minooka, Ill. L. B. Jackson, Chicago, is Chief Engineer.

Elk Mountain.—The surveys are now in progress for this road, which is to be built to the coal mines of Rock Creek. O. Metcalf is President, and H. H. Fisher Secretary. The principal office is in Denver.

Evansville, Fort Wayne & Chicago.—It is stated that the surveys for this road will be commenced within thirty days. It is proposed to build that part of the line between Lafayette and Fort Wayne first. The tow path of the old Wabash & Erie Canal is to be followed, so that but comparatively little grading will be necessary. If ever built the road will parallel the Wabash between these points. James Drew, of Indianapolis, and E. W. Shirk, of Peru, are interested in the project.

Fort Smith, Paris & Dardenelle.—President Cleveland has vetoed the bill granting the road right of way through the Indian Territory on the ground that indiscriminate grants to railroads permitting them to cross lands occupied by the Indians are dangerous to the success of the Government policy of Indian management, if not a violation of treaty rights.

Genesis & Obed River.—A survey is now being made for this road, which is projected to extend from Crossville, Tenn., to a connection with the Cincinnati Southern just north of Kismet, Tenn. New York capitalists are said to be interested in the road.

Georgia Pacific.—Construction is being rapidly pushed on the extension from Columbus to Greenwood, Miss., and rails are being laid on various parts of the road. It is expected to have through trains running from Atlanta, Ga., through Birmingham to the Mississippi River in the fall.

George's Valley.—The residents of the George's Valley are endeavoring to raise funds to have a survey made for a road projected to extend from Augusta, Me., through Liberty and Union to Warren, Me., on the Knox & Lincoln. The distance is about 40 miles.

Gulf & Chicago.—C. C. Merrick, of Chicago, the President of this proposed road, states that surveys have been made from Mobile, Ala., to Clarksville, Tenn., and that a contract has been let on the division from Faunsdale, Ala., to Cedar Point, 30 miles, and work commenced.

Gulf, Colorado & Santa Fe.—The extension from Ballinger to San Angelo, Tex., has now been completed for 30 miles, leaving but 5 miles of track to lay to reach San Angelo. It is expected that the road will be opened early next week.

Hartford & Fordville.—The projectors are trying to secure bonuses and right of way along the proposed route. The preliminary survey has just been completed. It is a short road projected to extend from Hartford to Fordville, Ky., about 15 miles.

Interoceanic.—It is stated that an English syndicate has subscribed for £1,800,000 in bonds and £500,000 in preferred stock of this road for building the division from Vera Cruz to the City of Mexico, and thence to Amacuzac, a distance of 494 miles. The company has control of 255 miles of short roads leaving 239 miles to be constructed. The line is to be completed in 3½ years. It is intended to have a pier at Vera Cruz. The company has the option of pushing on to the Pacific, at Acapulco, within two years. The debenture bonds will constitute a first charge on the lines, and they represent a capital liability of about £2,835 per mile. The preferred shares represent £2,025, and the service of the two would take altogether £154,000 per annum. The concession is for 99 years, the line then reverting to the state, but a fair price would be paid. The debentures run till 1928, but the right of the company to pay off at any time at the price of £110. The road will be narrow gauge.

Kansas City, El Paso & Mexican.—The engineers have begun locating the first ten miles out from El Paso, and it is stated that this section will be built by Oct. 26. The preliminary survey to White Oaks, N. H., 160 miles, has already been completed.

Kansas City, Memphis & Birmingham.—The survey for the branch from Aberdeen to Columbus, Miss., a

distance of 25 miles, has been completed, and contracts, will soon be let.

Kansas City & Sabine Pass.—It is stated that the entire issue of bonds has been placed. Grading will soon begin between Pierce City and Lamar, Mo.

Kings County (Elevated).—The company has executed a mortgage of \$7,000,000 to the Central Trust Co., of New York, to secure an issue of bonds at the rate of \$550,000 per mile. They will bear interest at 5 per cent. and run for 50 years. The money is to be used in extending and improving the road.

Kingston & Emory Gap.—It is reported that the capital to build this road has been subscribed, and that work will commence the present month. It is projected to extend from the Cincinnati Southern at Emory Gap to Kingston, Tenn., about seven miles. Edward Shelly, of Newbern, Va., is to construct the road.

Lake Shore.—The contract for grading this New Hampshire road has been awarded to James K. Ryan & Co., of Ware, Mass., the work to be commenced in 10 days and to be completed in three months. The line will branch off from the Boston, Concord & Montreal road at or near The Weirs, and will connect with the Boston & Maine at Alton Bay, the distance being about 17 miles.

Lancaster & Hamden.—It is reported that the difficulties with the contractors have been settled, and that funds for completing the road have been secured. It is to be built from Lancaster, O., to Tarilton, about 18 miles.

Leavenworth & Rio Grande.—Charter filed in Kansas to construct a road from Leavenworth in a south and southwesterly direction through the counties of Leavenworth, Wyandotte, Douglas, Johnson, Franklin, Miami, Coffey, Anderson, Woodson, Allen, Wilson, Neosho, Labette and Montgomery, the Indian Territory and the state of Texas to a point on the Rio Grande River. The estimated length of the line is 2,500 miles. The general office is to be at Leavenworth. The capital stock is \$51,000,000.

Long Island.—The company has filed for record in Long Island the mortgage for \$3,000,000 made in favor of the Central Trust Co., of New York. It is to secure \$3,000,000 of four per cent. bonds.

Louisville & Nashville.—The following is from the report of Mr. E. B. Dorsey to the English shareholders on the condition of the road: "In my judgment, arrived at after a most careful examination of the entire system, a portion of the net income for the next year, or perhaps two years, should be expended in perfecting the road and making it a thoroughly first-class property, thus reducing operating expenses, and consequently increasing the net earnings and future dividends. A sum equivalent to this expenditure should be divided in shares or scrip to the shareholders, which should give to them a dividend of 6 per cent. this year, and 8 to 10 per cent. next year, and still be under the actual net income."

Louisville, New Orleans & Texas.—The contract for building the 20-mile branch from Belmont to Beulah has been let to J. S. McTighe & Co., Memphis.

Maine Shore Line.—The company has now received subsidies aggregating nearly \$63,000 from various towns along the proposed line, and it is expected that about \$49,000 more will be raised in Eastport, Me., the terminus of the road. A force of graders is now at work on the line, and it is stated that the road will be completed as rapidly as possible. S. E. Greene, of Machias, Me., is President.

Memphis & Atlantic.—The Mississippi and Tennessee divisions of the Memphis, Tuscaloosa & Atlantic, and Memphis, Oxford & Columbus have been consolidated under the above name. The road will run from Memphis, Tenn., via Aberdeen, Miss., to Tuscaloosa, Ala. The survey has been finished to Columbus, Mass. Another survey will soon be made via Carrollton through Pickens.

Michigan Central.—The examination of the river bottom, which has been in progress several weeks, at Detroit has been finished, and the construction of either a tunnel or bridge is deemed practicable. The greatest depth of water is 51 ft. The earth is mostly clay, with a stratum of rock at from 72 to 92 ft. from the water's surface.

Middletown & Hummelstown.—Articles of incorporation have been filed in Pennsylvania. John W. Rife, of Middletown, is President.

Midland (Indiana).—Construction work has been suspended on the extensions of this road, and nothing is being done on the shops at Lebanon. The decision of the Supreme Court of Indiana in the subsidy case has, it is said, interfered considerably with the company's plans.

Milledgeville & Asylum.—A company has been organized under this name by Solomon Barrett and others to build a dummy road 3 miles in length at Milledgeville, Ga.

Minneapolis & St. Paul Rapid Transit.—Charter filed in Minnesota to construct underground or elevated roads between St. Paul and Minneapolis and to various suburban towns near those cities.

Missouri, Kansas & Texas.—It is said that the first mortgage bondholders are preparing an application for a receiver for the road. It will be remembered that the general mortgage bondholders applied for a receiver at Leavenworth about six weeks ago, but a stay of proceedings was granted at the request of stockholders. The Court also agrees to give twenty days' notice to stockholders before a receiver is appointed. No receiver, it is understood, can be appointed for the first mortgage bonds until this application of the general mortgage bonds is disposed of. The committee appointed to investigate the relations of the Missouri Pacific, Kansas & Texas roads has completed its report, and it will be made public in about a week.

Montreal & European.—A suit has been brought by the company against the Canadian Government to recover \$600,000 as compensation for the value of the franchise granted to the company under an act of the Canadian Parliament, by which powers were granted to the plaintiffs for the construction of a road from Oxford, N. S., to New Glasgow, with branches to Pugwash and Pictou. The proceedings were anticipated by an act of Parliament, which provided that in the event of the Government assuming control of the road the amount of compensation to be paid was to be settled by arbitration, but in case of the arbitration not being agreed upon, it was provided that this suit should be brought to settle the question. The Government took over the road when 70 miles had been completed, but terms could not be agreed upon, the Government alleging that the company had failed to carry out its contract.

Mount Pleasant & Seaview City.—The contract for building the road has been let to Ira L. Willis, of New York City. The road is to extend from Mount Pleasant to Sullivan's Island. Connection will be had with Charleston, S. C., by ferry to run from the northern part of the city to

a pier to be constructed out to the channel. The company also has the privilege of building a bridge across the Cooper River, connecting with the various roads terminating in Charleston. The company has a capital stock of \$200,000, besides which \$200,000 of first mortgage bonds have been issued and placed.

Nashville & Knoxville.—Over 15 miles of grading has now been completed on the division from Carthage to Cookeville, Tenn., and work is being vigorously pushed on the remaining 22 miles to Cookeville. The survey has been completed from Cookeville to coal-fields about 30 miles easterly.

New Roads.—New York parties are said to have under consideration the building of a new line from the Edgar-Thomson Steel Works, near Pittsburgh, to Minerva, O., and thence over the Lake Erie, Alliance & Southern to Phalanx, O., from which point it is proposed to build an extension to Lake Erie. It is added that "nothing definite has been decided upon." It is stated that the capital has been secured for building a road from Plain Dealing, on the Shreveport & Arkansas, to Homer, Claiborne Parish, La. Surveys are to commence soon.

New York, Cresson & Clearfield.—At a meeting of the stockholders at Pittsburgh on Aug. 2, the stock of Pittsburgh parties in the road, comprising the Atterbury interest of 80,000 shares, was transferred to Morton, Bliss & Co., of New York, giving them a controlling interest in the road. The consideration is said to be \$60,000.

New York, Mahoning & Western.—The motion of the railroad praying for a dissolution of the previous injunction granted the Mahoning Construction Co., which prohibited the running of trains, was argued this week at Toledo, Ohio. Judge Lemmon granted the motion and ordered that the plaintiff pay the cost of the injunction. The plaintiff excepted and gave notice of its intention to appeal to the Circuit Court of the county.

Northwest & Florida.—The contract has been let to extend this road from its present terminus south to Laverne, Ala. The work of changing the gauge to standard is expected to begin in October.

Northern Pacific.—A Winnipeg dispatch of Aug. 1 gives some particulars of the agreement that has been entered into between the Manitoba Government and the chief owners of this road. The Northern Pacific agrees to build this year the extension to Portage la Prairie, and next year to continue the line to Brandon. No arrangements are made as to branch line extensions. The agreement has a provision concerning rates from the province to Duluth on wheat and certain other classes of freight. It also stipulates that the Northern Pacific shall not enter into any pooling arrangements with the Canadian Pacific. The Manitoba Government is to call for tenders for the building of the Portage link at once. Chief Engineer Kendricks, of the Northern Pacific, will proceed to Winnipeg immediately to commence operations. A competitive route to Eastern Canada will be secured via the Wisconsin Central and Grand Trunk. A decision was filed on Aug. 4, by Judge C. B. Sleeper, of the Fifteenth Minnesota Judicial district, which purports to settle the status of the entire Northern Pacific indemnity lands in the state courts, covering the whole question of jurisdiction, the indemnity, withdrawals, and the legality of the orders and decisions of the Department of the Interior opening the said lands to settlement. The decision affirms the jurisdiction of the courts, and to prevent clouding of titles, enjoins settlers from offering to make final proofs or from receiving receivers' receipts. Several hundred settlers are affected by the decision.

Ohio, Indiana & Western.—The company has filed in Indiana a copy of a mortgage to secure the first mortgage 50 year bonds of the company amounting to \$8,500,000, purchased by the Central Trust Co. of New York. The Central Trust Co. is to hold 1,000 of the bonds of \$1,000 each to meet the payment of the 7 per cent. bonds of the old Indiana, Bloomington & Western bonds due in 1900.

Ohio & Northwestern.—Application was made in the United States Court at Cincinnati last week, by Receiver Hunt, for authority to issue Receiver's certificates, bearing six per cent. interest, to the amount of \$350,000. The certificates are wanted for improvement of the roadbed, purchase of rolling stock, and to complete payment for real estate for terminals.

Ohio Valley Railway & Terminal Co.—Incorporated in Indiana to construct a road from the bridge over the Ohio River at Henderson, Ky., to Evansville, Ind., a distance of three miles. The capital stock is \$300,000.

Omaha, Dodge City & Southern.—The preliminary survey is reported completed from Dodge City to Mankato, Kan., near the northern line of the state. The survey is to be continued to Superior, Neb., about 25 miles further northeast.

Oregon Pacific.—It is announced that work will begin on the line east of Albany at once, and be prosecuted until the rainy season begins. Next spring the line will be pushed eastward. The road is now in operation from Yaquina, Ore., on the Pacific Coast, easterly 72 miles to Corvallis, Ore., about 12 miles west of Albany. The grading has been completed for a number of miles further. Engineers are now re-locating parts of the line, principally in the Cascade Mountains, and it is said that a shorter route over the mountains than the present one has been found, which will also avoid a tunnel.

Oregon & Washington Territory.—On the line being constructed from Wallula to Walla Walla, Wash. Ter., a distance of 54 miles, tracklaying has been finished to Eureka Flat, 18 miles from Wallula. Tracklaying has also been completed from Wallula to Centreville, Or., a distance of 34 miles, and this line is being extended 15 miles south. Grading has been temporarily suspended on the 20 mile branch up Eureka Flat.

Paris, Marshall & Sabine Pass.—The company has filed a mortgage in the County Court at Paris, Tex., to secure an issue of first mortgage bonds the proceeds of which are to be used in the construction of the road.

Pemberton & Hightstown.—It is announced that the road will be re-opened for traffic on Aug. 10. The organization of the Union Construction Co., which is to operate the road, has been completed and the capital all subscribed. The lease has been signed, and two locomotives and several cars purchased.

Philadelphia & Reading.—A settlement has been effected between the company and the holders of the divisional mortgage bonds of the West Point iron ore lands issued by the Coal & Iron Co. and guaranteed by the railroad. The price paid was par and interest at the rate of either 4 or 5 per cent. for the four years the interest has accumulated. The successful conclusion of these negotiations disposes of about the last of the smaller opposition connected with the reorganization of the company. The ore lands embrace 2,793 acres in Putnam County, N. Y., and were purchased by ex-President Gowen for \$425,000.

It is stated that the company will soon build a large passenger station at the foot of Walnut street, Philadelphia, the terminus of the Atlantic City branch.

Philadelphia & Reading.—It is stated that engineers in the employ of the company are at work surveying the route by which the Central of New Jersey expects to enter Allentown, Pa., and laying out the site for a union depot for both companies. The new depot will be erected on Hamilton street, the best business avenue of the town, and the freight station on Linden street. The Lehigh Valley is also reported to have surveyors at work in Salisbury Township, Pa., near Allentown.

Portage.—Incorporated in Michigan to construct branch roads in Houghton County, to reach stone quarries. The capital stock is \$100,000.

Portland & Ogdensburg.—The citizens of Portland, Me., at an election held Aug. 2, ratified the lease of the road to the Maine Central by a majority of 967.

Portland & Vancouver.—Tracklaying has been commenced on the main line which extends from East Portland, Or., to a point on the Columbia River opposite Vancouver, Wash. Ter., a distance of eight miles. A branch will be built from Albina, Or., on the main line, to the town of St. Johns, on the Willamette River, a distance of seven miles. A branch will also be built between Clarno, O., on the Oregon Railway & Navigation Co.'s road, and Albina, about five miles in length. This branch is to afford facilities for shipping eastward the lumber to be manufactured at Vancouver by mills now being erected. The Portland Paving & Macadamizing Co. has the contract for grading, and Pacquet & Smith, of East Portland, Or., for bridges and trestles.

Richmond & Chesapeake.—A force of men were put at work last week on the shaft to be sunk at Eighth street, Richmond. It will be 8 x 15 ft. and 36 ft. deep. J. C. Carpenter & Co., the contractors for the tunnel, are making rapid progress in the open cut at the north end of Eighth street.

Roanoke & Southern.—The contract to grade and bridge the road from Winston, N. C., to Walnut Cove, 18 miles, has been awarded to Griffin & Gordon, of New York.

St. Louis, Iron Mountain & Southern.—A Little Rock dispatch states that remarkable prosperity is now enjoyed by this road on all its divisions. The number of saw mills on its line in Arkansas has doubled during the present year. Fifty special sidings have been laid for the accommodation of new mills and factories. The Camden branch, extending from Gurdon to Camden, is being substantially rebuilt. Through trains are now run between Little Rock and Memphis over the Bald Knob branch, and this branch is doing a very fine business. The extension of the Little Rock and Fort Smith division from Fort Smith to Wagner, 100 miles, has just been opened for business. A large freight yard has been laid out at Baring Cross. It will have 40 tracks capable of holding 50 cars each, and will be made a divisional terminus for freight trains.

St. Paul, Minneapolis & Manitoba.—Tracklaying on the Eastern Railroad of Minnesota was on Aug. 1 completed across the Kettle River Bridge, 13 miles from Hinckley, Minn. On this end of the line the track has been laid for 25 miles, leaving but little more than 20 miles yet to be finished to give the Manitoba system a direct outlet to Lake Superior. All this 20 miles is ready for tracklaying, and when the rails have been received they will be laid at the rate of a mile a day. Tracklaying has now been completed on the extension from Watertown southwest to Huron, Dak. The distance is 68 miles. It connects at both Watertown and Huron with the Chicago & Northwestern, and at the former place with the Minneapolis & St. Louis also.

San Francisco & North Pacific.—Nearly all of the grading on the extension from Cloverdale to Ukiah, Cal., 28½ miles, has been completed, and tracklaying will soon begin. The rails have arrived and are delivered at various places along the line. It is thought the road will be opened in October.

San Francisco & Santa Cruz.—It is reported that the projectors of this road, which was to run along the seashore by Halfmoon Bay, have abandoned their scheme, but Chief Engineer F. T. Newberry says that another company will probably take up the project soon.

Silverton.—Tracklaying has now been completed from Silverton through Chattanooga to near Ironton, Col., a distance of ten miles. It is not expected to have the road opened to Ironton until early in September, although trains are running to within a mile of the summit of Red Mountain. The survey has been completed to Ouray, about 18 miles from Silverton. When the road is opened to Ouray, it will form a link in the Denver & Rio Grande's "Round the Circle" tourists route from Denver to Ouray, Ouray (at present by stage) to Silverton, and Silverton by the San Juan branch, back to Denver—a trip giving views of some of the grandest scenery in the United States.

Sioux Falls, De Smet & Northern.—A party has started from Sioux Falls, Dak., to make a preliminary survey of this line, which is thought, by the local press, to be projected by the Illinois Central. The members of the corps are F. A. Bratka, P. G. Burns, J. A. McFee, F. S. Terrill, C. Funke, Oscar Finkelnburg and C. S. Randall. M. S. Parker is Chief Engineer.

Southern Central.—It is stated that the Lehigh Valley has decided to discontinue operating the Ithaca, Auburn & Western division of this road, as it has not proved profitable. The branch extends from Freeville to Auburn, N. Y., 39 miles, and is leased to the Southern Central at an annual rental of 33½ per cent. of the gross earnings. In December, 1886, the Southern Central was leased to the Lehigh Valley.

Staten Island Rapid Transit.—The survey of the line to connect the Arthur Kill bridge with the Central Railroad of New Jersey is about completed. The line will strike the Central at some point between Roselle and Elmore. Baltimore dispatches state that the directors of the Baltimore & Ohio have determined to push the completion of this road and to avail themselves of traffic agreements with the Philadelphia & Reading and the Central of New Jersey, to the end that through traffic may be taken to and from the deep water terminus at Staten Island as soon as the connections at the bridge are completed, which, it is stated, will be within a few months.

Tacoma, Orting & Southwestern.—The preliminary surveys are now being made for this recently incorporated road. The line being surveyed extends from near Orting, Wash. Ter., on the Northern Pacific, southwest 60 miles toward the Cascade Mountains.

Toledo, Saginaw & Mackinaw.—Tracklaying on this road has now been completed from East Saginaw, Mich., to within 30 miles of Durand, the southern terminus. Cuts are being filled in at Cold Creek, near Flushing, and when

this work is finished the track will soon be laid to Durand, 53 miles from East Saginaw.

Walhonding & Mohawk Valley.—Charter filed in Ohio to build a road from Jefferson, Coshocton County, to a connection with the Cleveland, Akron & Columbus, in Bedford township. The capital stock is placed at \$1,500,000.

Western Maryland.—The following are the prices to be paid per cubic yard for the various kinds of work on the extension of the Western Division of the Baltimore & Harrisburg, from Ortanna, Pa., 8 miles west of Gettysburg, to a junction with the main line of the Western Maryland, in Washington County, Md., near Blue Ridge Summit, Franklin County, Pa., the letting of which to Messrs. Keller & Crossan was noted in our issue of July 27: For tunnel excavation, \$3; solid rock, 70 cents; loose rock, 85 cents; earth, 20 cents; first-class bridge masonry, \$8; second-class bridge masonry, \$6; culvert masonry, \$3; ballast, 70 cents. The contract does not include bridge superstructure, of which there is very little, nor tracklaying. The length of line under contract is 15 miles. The route is practically that of the old "Tapeworm" railroad, projected and partially constructed by the Hon. Thaddeus Stevens, some 51 or 52 years ago. Changes are made to avoid two of the tunnels, and to shorten the line about 1½ miles. Ten miles of the line under contract is on the ascent of the Blue Ridge Mountain from the old Maria Furnace to Blue Ridge Summit. The road is to be completed and put in operation to Fairfield, Pa., this fall, probably by the middle of November, and the entire line is to be completed by May 1, 1889.

West Shore.—In the case of the United States Trust Co., of New York, against the New York, West Shore & Buffalo Co., A. S. Cassidy, the referee, this week presented to Judge Charles F. Brown, at the Special Term at Newburg, his second account for the period from June 1, 1886, to July 25, 1888. The Court ordered that he give notice to the parties interested that he would apply in Newburg, Oct. 20, for confirmation. The balance in the hands of the referee, deposited in the Union Trust Co., June 1, 1886, was \$1,040,546, and he received from the Trust Co. \$8,830 interest. He has paid out by order of the court \$922,106, leaving a balance of \$127,277.

Williamstown & Delaware River.—The extension from Glassboro' to Mullica Hill, N. J., is fast being pushed to completion, and the work of laying the rails will soon be completed. The distance is seven miles.

Winona & Southwestern.—The company filed for record in Winona, Minn., on Aug. 6, a copy of the first mortgage on the road, made in favor of the Farmers' Loan & Trust Co., of New York. The mortgage is for \$6,950,000, and is at the rate of \$18,500 per mile. The right of way has been secured for the 20 miles recently placed under contract.

TRAFFIC AND EARNINGS.

Traffic Notes.

Lake rates from Chicago to Buffalo continue to rise and are now quoted on a basis of 2½ cents per bushel on corn and 3 cents on wheat.

Chicago Kansas City lines are paying a commission of \$4, and in some cases more, on first-class tickets, thus enabling the scalpers to make a material reduction to passengers.

The Chicago & Atlantic has announced a round trip of \$18.50, Chicago to New York and return, for clubs desiring to participate in the reception to James G. Blaine on his arrival from Europe. Whether purchasers are required to sign an agreement to vote for Blaine in 1892 is not stated. In fact, they are not positively required to shake hands with him, and those who are his confirmed enemies can, doubtless, secure the special tickets by depositing \$18 and a bonus of half a dollar.

The pig-iron shipments of the Alabama Great Southern from Birmingham for the month of July were 85 per cent. larger than for the same month of last year.

Overland traffic over the Southern Pacific is now heavier than ever before. The number of regular freight trains has for some time been 3 each way daily, but 4 extras are now a regular thing. The traffic from New York coming by steamer to New Orleans provides most of this business, and the company is soon to place on the line a new vessel of 3,531 tons, to be built by Cramp & Sons, of Philadelphia.

The executive committee of the Trunk Line Association voted on Tuesday to make emigrant rates to all points west on and after Aug. 10 on the basis of \$5 from New York and Boston to Chicago, \$4.50 from Philadelphia and \$4.40 from Baltimore.

The Baltimore & Ohio road is carrying emigrants from Baltimore to Chicago for \$4.

It is reported that freight rates from New York to Missouri River points will be advanced on Aug. 15 to the old basis of \$1.37 per 100 lbs. first-class.

A Chicago paper states that the Chicago & Northwestern brings to that city daily large quantities of California fruit, which is sold at auction for account of the railroad company.

The Trunk Lines are conferring with reference to a restoration of freight rates, and it is given out that the regular tariff will probably be put in force about Sept. 1, but no definite action has yet been taken.

Suit Against Iowa Roads.

Suits have been commenced in the Polk County District Court (Des Moines) against the Chicago & Northwestern, Chicago, Burlington & Quincy, and Chicago, Rock Island & Pacific under the damage clause of the new railroad law, claiming in each case \$5,000 penalty for willful violations of the law. Five suits were commenced against the Northwestern, three against the Rock Island, and two against the Burlington. The papers are signed by the Attorney-General and another lawyer, attorneys for the state. The petitions minutely detail the several cases in which violations are charged, and then go on to claim that the Commissioners' tariff is in full force and effect, notwithstanding Judge Brewer's injunction; that the roads are subject to its provisions, and that the tariff is reasonable and just.

The International Railway Association.

The roads belonging to the Texas Traffic Association at a protracted convention in New York City dissolved the association, and have formed a new one under the above name. The headquarters of the new organization will be at Denver, Col. The new association will include, besides members of the old one, the International & Great Northern and the Atlantic and Pacific systems of the Southern Pacific. It is expected that a number of the Mexican roads, including the Mexican National, the Mexican International and the Mexican Central, will also join the association.

Southern Railway and Steamship Association.

The organization expired July 31 by limitation. In the reorganization the Louisville & Nashville and the Cincinnati, New Orleans & Texas Pacific did not participate, and they have notified all roads that they will not join in any further organization of the kind at present. Commissioner Talcott has dismissed 30 men from his clerical force.

Southern Pacific Rates.

Freight rates from San Francisco to El Paso and Deming have been reduced to 30 per cent. in each class from the old tariff. Freight from San Francisco, destined for the Republic of Mexico, takes the following rates to El Paso and Deming: First class, \$1.88; second, \$1.61; third, \$1.43; fourth, \$1.28; fifth, \$1.05; A, \$1.10; B, 99c; C, 84c; D, 64c; E, 54c. To the City of Mexico the following rates are made, and are made subject to the Western classification for the first time: First class, \$3.64; second, \$3.16; third, \$2.86; fourth, \$2.58; fifth, \$2.22; A, \$2.27; B, \$2.03; C, \$1.78; D, \$1.43; E, \$1.33. A revised tariff to territorial points is being prepared by the Southern Pacific to meet the heavy cuts now being made by Eastern lines to Salt Lake City.

The Inter-state Commerce Commission.

The Commission has announced its decision on the complaint of the Kentucky & Indiana Bridge Co. against the Louisville & Nashville Railroad. The Commission holds that the complainant is a common carrier, and the defendant is bound to give it equal facilities for interchange of traffic with others. Commissioner Schoonmaker dissented.

The Chicago Board of Trade has filed with the Commission two petitions, one of which is a complaint against the Chicago, Rock Island & Pacific and Baltimore & Ohio roads, the other against the Pennsylvania and the Chicago & North-western. The charge in each case is that Chicago has been discriminated against by these roads, by the use of a joint through rate from Iowa and Nebraska points to the seaboard, which is very much less than the sum of the local rates. It is charged that this is a violation of the first, second and third sections of the Inter-state Commerce law.

Earnings of South Carolina Roads.

The Railroad Commissioners of South Carolina have issued their monthly report of the earnings of the railroads in the state for the month of June, as compared with the same period last year. Of the twenty-five roads included in the report all but four show a net increase. The total earnings were \$446,949 against \$398,315 in June, 1887, showing a total net increase of \$48,634. The total freight earnings for the month were \$241,769, and the passenger earnings \$157,048, against \$211,242 and \$135,144, respectively, in June of last year.

East-bound Shipments.

The east-bound through shipments of freight by all lines for the week ending Aug. 4 amounted to 43,000 tons, against 39,052 tons during the preceding week, an increase of 3,948 tons and against 33,508 tons during the corresponding week of 1887, a decrease of 9,532 tons. The following percentages give the details:

Wabash, 12; Michigan Central, 9; Lake Shore & M. S., 16; Pitts., Ft. Wayne & Chic., 16; Chic. St. L. & P., 11; Baltimore & Ohio, 4; Chicago & Grand Trunk, 13; N. Y., Chic. & St. Louis, 6; Chicago & Atlantic, 10; total, 100.

Of the above shipments 3,872 tons were flour, 10,652 tons grain, 3,683 tons millstuf, 4,989 tons cured meats, 1,680 tons lard, 7,192 tons dressed beef, 1,799 tons butter, 2,060 tons hides, 1,592 tons wool, and 3,586 tons lumber.

Cotton.

The cotton movement for the week ending Aug. 3 is reported as follows, in bales:

Interior markets: 1888. 1887. Inc. or Dec. P. c.
Receipts..... 6,182 2,561 I. 3,621 150.0
Shipments..... 4,480 1,870 I. 2,610 150.0
Stock..... 23,685 26,018 D. 2,333 7.7

Seaports:
Receipts..... 6,384 1,490 I. 4,895 400.0
Exports..... 13,831 19,400 D. 5,569 26.3
Stock..... 181,791 158,537 I. 23,254 14.5

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending July 28, and the year to that date, was as follows:

Total for week ending July 28: 224,638 78,309 302,947
Total for year 1888 to date: 6,669,019 2,211,245 8,880,264
Total for year 1887 to date: 5,958,070 1,829,466 7,787,536

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

Total for week ending July 28: 37,480 30,791 I. 6,689
Total for year to July 28: 884,685 972,530 D. 87,844

The coal tonnages for the week ending Aug. 4 are reported as follows:

Anthracite: 754,881 680,817 74,064 10.8
Bituminous: 329,432 161,899 167,533 25.6

The Cumberland coal trade for the week ending Aug. 4 amounted to 76,691 tons, and for the year to that date 2,059,190 tons.

Trunk Line Earnings.

The following is a comparison of the gross and net earnings of the trunk lines from Jan. 1 to June 30 for three years:

New York Central & Hudson River:

Jan. 1 to June 30:

Gross earnings..... \$10,636,300 1888. 1887. 1886.
Net earnings..... 5,633,968 10,725,725 5,838,920 \$14,912,612

*** Pennsylvania:**

Gross earnings..... 27,858,98 28,370,724 23,250,164
Net earnings..... 8,082,758 8,784,389 7,609,624

+ N. Y., Lake Erie & Western:

Gross earnings..... 11,741,017 11,446,305 10,457,049
Net earnings..... 3,331,850 3,251,346 2,802,421

Lake Shore & Mich. South:

Gross earnings..... 8,671,905 8,644,336 6,933,682
Net earnings..... 3,342,935 3,576,198 2,447,697

Michigan Central:

Gross earnings..... 6,535,000 6,361,000 5,436,000
Net earnings..... 1,410,000 1,850,000 1,484,000

Total:

Gross earnings..... 71,442,506 69,584,000 60,989,507
Net earnings..... 22,311,511 23,320,847 18,718,862

* Lines east of Pittsburgh and Erie.

+ Less amounts due leased lines.

Railroad Earnings.

The statement of earnings, operating expenses, etc., of the New York Central & Hudson River Railroad and its leased lines for the quarter ending June 30 is as follows:

Three months to June 30:

Gross earnings..... \$8,469,837 1888. 1887. Inc. or Dec.
Operating expenses..... 5,835,391 5,357,910 I. 477,481
P. c. ex. to earnings..... 68.54 62.64

Net earnings..... \$2,634,446 1888. 1887. D. 761,988
Fixed charges..... 1,954,860 1,957,200 D. 2,340

Profit..... \$709,616 1888. 1887. D. 311,618
Dividend..... 894,283 894,283

Deficiency..... \$184,667 1888. 1887. \$428,981 \$611,648

* Surplus.

The statement for nine months to June 30 is as follows:

Six months—Jan. 1 to June 30:

Gross earnings..... \$26,642,839 1888. 1887. Inc. or Dec.
Operating expenses..... 18,077,890 18,325,555 I. 282,716
P. c. of ex. to earn..... 67.85 63.40

Net earnings..... \$8,564,949 1888. 1887. D. 761,988
Fixed charges..... 5,864,580 5,871,600 D. 7,020

Profit..... \$2,700,369 1888. 1887. D. 761,988
Dividends..... 2,682,849 2,682,849

Surplus..... \$17,531 1888. 1887. D. 761,988

The statement of gross earnings for July is as follows:

Month of July:

1888. 1887. Inc. or Dec.
\$2,850,191 \$2,779,198 \$70,993

The statement of the Chesapeake, Ohio & Southwestern for the month of June and the half year ending June 30 shows:

Month of June:

Gross earnings..... \$143,249 1888. 1887. Inc. or Dec.
Operating expenses..... 101,423 89,211 I. 12,212

Net earnings..... \$41,826 1888. 1887. D. 13,400

Six months to June 30:

Gross earnings..... \$912,899 1888. 1887. I. 87,100
Operating expenses..... 625,374 531,140 I. 94,233

Net earnings..... \$287,525 1888. 1887. D. 7,133

The statement of earnings and expenses of the Chicago, Burlington & Quincy for June and the half year ending June 30 is as follows:

Month of June:

Gross earnings..... \$1,953,934 1888. 1887. Inc. or Dec.
Operating expenses..... 1,599,333 1,379,286 I. 320,047

Net earnings..... \$354,601 1888. 1887. D. 506,946

Six months:

Gross earnings..... \$9,975,966 1888. 1887. D. 3,300,140
Operating expenses..... 7,281,127 7,281,127 I. 1,401,408

Net earnings..... \$1,293,431 1888. 1887. D. 4,701,548

The statement of the Ohio River for June and the half year ending June 30 shows:

Month of June:

Gross earnings..... \$9,975,966 1888. 1887. Inc. or Dec.
Operating expenses..... 7,281,127 7,281,127 I. 1,401,408

Net earnings..... \$1,293,431 1888. 1887. D. 4,701,548

Jan. 1 to June 30:

Gross earnings..... \$129,646 1888. 1887. D. 66,615
Operating expenses..... 84,771 84,771 I. 34,643

Net earnings..... \$44,875 1888. 1887. D. 31,972

The following is the statement of the earnings of the Union Pacific for June and the half year to June 30:

Month of June:

Gross earnings..... \$2,483,268 1888. 1887. Inc. or Dec.
Operating expenses..... 1,004,217 1,004,217 I. 8,747

Net earnings..... \$1,479,051 1888. 1887. D. 7,905

Jan. 1 to June 30:

Gross earnings..... \$13,493,580 1888. 1887. I. 471,688
Operating expenses..... 8,528,194 8,338,919 I. 187,275

Net earnings..... \$4,965,386 1888. 1887. I. 284,413

The statement for the quarter ending June 30 of the New York, Pennsylvania & Ohio shows:

Month of June:

Gross earnings..... \$504,122 1888. 1887. Inc. or Dec.
Operating expenses..... 14,542 14,492 I. 50

Net earnings..... \$489,580 1888. 1887. I. 52,992
Fixed charges..... 338,849 324,315 I. 14,534

Surplus..... \$150,730 1888. 1887. D. 38,357
Cash on hand..... 89,170 135,021 D. 45,851

Profit and loss sur..... 198,030 118,269 I. 79,761

The statement of the Philadelphia & Reading for June, 1888, as compared with the same month in 1887, shows:

A increase in gross earnings

For the Railroad Co. of..... \$65,073
For the Coal and Iron Co. of..... 384,652

A increase in expenses

For the Railroad Co. of..... \$45,953
For the Coal and Iron Co. of..... 378,652

A increase in net earnings of..... \$25,120

The statement for the seven months ending June 30, 1888, as compared with the same period in 1887, shows:

A decrease in gross earnings of..... \$1,613,900

A decrease in expenses of..... 108,055

The following is the June statement of the Cleveland, Columbus, Cincinnati & Indianapolis, including the Cincinnati & Springfield and the Indianapolis & St. Louis:

Month of June:

Gross earnings..... \$612,451 1888. 1887. Inc. or Dec.
Operating expenses..... 437,728 418,333

Net earnings..... \$174,723 1888. 1887. I. 20,390
Interest, taxes, etc..... 157,500 173,856

Balance..... \$17,293 1888. 1887. D. 33,356
Additions to property..... 28,740 12,592

Balance..... \$11,517 1888. 1887. D. 20,764

For the six months ending June 30 the statement is as follows:

Month of June:

Gross earnings..... \$3,500,410 1888. 1887. Inc. or Dec.
Operating expenses..... 2,633,798 2,468,894

Net earnings..... \$866,612 1888. 1887. I. 1,033,974
Interest, taxes, etc..... 949,299 1,314,452

Balance..... \$32,522 1888. 1887. D. 32,522
Additions to property..... 121,415 409,234

Deficit..... \$203,032 1888. 1887. D. 376,712

The statement of the business of all lines of the Pennsylvania east of Pittsburgh and Erie for June, 1888, as compared with the same month in 1887, shows:

An increase in gross earnings of..... \$168,542

An increase in expenses of..... 158,462

A increase in net earnings of..... \$10,080

The six months of 1888, as compared with the same period of 1887, show:

An increase in gross earnings of..... \$1,487,474

An increase in expenses of..... 1,579,099

A decrease in net earnings of..... \$91,625

All lines west of Pittsburgh and Erie for the six months of 1888 show a deficiency of \$219,900, being a loss as compared with the same period of 1887 of \$320,682.

The statement of the Boston & Albany for the quarter ending June 30 is as follows: Gross earnings, 1888, \$2,135,853; 1887, \$2,187,668. Operating expenses, 1888, \$1,552,272; 1887, \$1,572,845. Fixed charges, 1888, \$187,546; 1887, \$188,058. Net income, 1888, \$396,035; 1887, \$426,724. Cash on hand, 1888, \$564,276; 1887, \$797,095. Profit and loss deficiency, 1888, \$1,097,475; 1887, \$1,315,444.

E. L. Dudley, Receiver of the Central Iowa Railway, reported to the Federal Court his receipts and expenditures for March, April and May, 1888. The total earnings for March were \$124,312, and the net earnings \$23,596 for April. The total earnings were \$103,191, and the expenses exceeded the earnings by \$6,774. For May the total earnings were \$103,030, and the net earnings were \$5,742.

Earnings of railroad lines for various periods are reported as follows:

Month of June:

Allegheny Valley..... 1888. 1887. Inc. or Dec. P. c.
Net..... 60,172 57,630 I. 2,542 3.0

California South..... 1888. 1887. Inc. or Dec. P. c.
Net..... 23,394 23,394 I. 0 0.0

Cam. & Atl. & Bra..... 1888. 1887. Inc. or Dec. P. c.
Net..... 68,036 61,123 I. 6,913 10.0

Chi. Bur. & Q..... 1888. 1887. Inc. or Dec. P. c.
Net..... 1,053,934 2,140,833 D. 1,086,899 8.7

Den. & R. G. W..... 1888. 1887. Inc. or Dec. P. c.
Net..... 254,601 254,601 I. 0 0.0

Lon. N. O. & Tex..... 1888. 1887. Inc. or Dec. P. c.
Net..... 110,037 99,407 I. 10,630 11.0

Memphis & Chas..... 1888. 1887. Inc. or Dec. P. c.
Net..... 29,751 29,751 I. 0 0.0

N. Y., Ont. & W..... 1888. 1887. Inc. or Dec. P. c.
Net..... 144,044 111,822 I. 32,222 28.8

Northern Pacific..... 1888. 1887. Inc. or Dec. P. c.
Net..... 22,735 10,047 I. 12,688 126.0

Ohio & Miss..... 1888. 1887. Inc. or Dec. P. c.
Net..... 111,994 111,994 I. 0 0.0

Ohio River..... 1888. 1887. Inc. or Dec. P. c.
Net..... 58,261 58,261 I. 0 0.0

Phil. & Erie..... 1888. 1887. Inc. or Dec. P. c.
Net..... 153,091 130,759 I. 22,332 16.9

Pitts. & West..... 1888. 1887. Inc. or Dec. P. c.
Net..... 25,293 21,776 I. 3,517 14.3

Seab. & Roanoke..... 1888. 1887. Inc. or Dec. P. c.
Net..... 1,610,137 1,449,102 I. 161,035 40.1

Union Pacific..... 1888. 1887. Inc. or Dec. P. c.
Net..... 751,421 444,670 I. 306,751 68.9

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 289,313 297,924 D. 8,611 2.7

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 98,832 98,832 I. 0 0.0

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 44,184 27,472 I. 16,712 59.2

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 19,070 11,106 I. 7,964 63.6

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 431,172 397,583 I. 33,589 8.3

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 191,508 184,364 I. 7,144 3.8

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 175,519 147,584 I. 27,935 18.0

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 37,747 41,072 I. 3,325 8.8

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 41,403 25,668 D. 15,735 37.9

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 8,633 12,568 D. 3,935 45.8

West J. & Brs..... 1888. 1887. Inc. or Dec. P. c.
Net..... 2,483,268 2,508,828 D. 25,560 0.9